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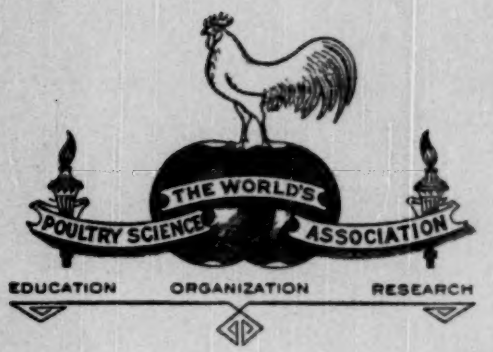

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1950

Official Organ of the

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Volume 6 - Number 3

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Volume 6 July-September Number 3

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NINTH WORLD'S POULTRY CONGRESS

Word has been received from Mr. Alex Wiltzer, President of the Ninth World's Poultry Congress to be held in Paris, France, August 2-9, 1951, that work is progressing.

The Preliminary Announcement of the Congress is in press and should be available soon.

The Congress will be held in the Grand Palais, a very magnificent building centrally located and capable of handling exhibits and many meetings. It is planned to have five sectional meetings in which during the Congress 100 papers will be presented. Five general papers will be presented at the plenary session on subjects of vital interest to the members of the poultry industry. A live bird exhibit and a commercial material exhibit are to be held on an international basis. Several interesting and colorful social events are to be scheduled. Tours to points of interest will be operated daily, and a series of post-congress tours are to be available for those interested.

National Committees for the Ninth World's Poultry Congress should be set up in every country where possible. Proposals for the presentation of papers should be made through the National Committee. If no National Committee has been organized, then Members of the Association should submit their proposals directly to the French Committee.

Membership is of the following types: (1) *Participating member* of Congress—3500 French Francs. Entitles the holder to participate in the Congress activities and to receive the Congress reports. (*World's Poultry Science Association members are entitled to a reduction of 20%*). (2) *Wife or relatives* of the Congress member—1750 French Francs. Entitles the holder to the same privileges as (1) but will not receive the Congress reports. (3) *Absentee member*—1750 French Francs —will receive the Congress reports and other printed matter.

Information concerning Congress plans and details may be obtained by writing to the following: Mr. Alex Wiltzer, President, Ninth World's Poultry Congress, 28 Rue Bonaparte, Paris 6, France or Mr. P. Waroquiez, Secretary-General, Ninth World's Poultry Congress, 12 Rue d'Armaille, Paris 17, France.

FLOOR LITTER MANAGEMENT AS A FACTOR IN POULTRY NUTRITION*

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Poultry feeding, management, and sanitation are being profoundly affected by the rapidly increasing use of built-up floor litter in brooder and laying houses. Until recently, the necessity of frequent removal and renewal of the floor litter to prevent or control certain diseases, especially coccidiosis was taken for granted. Contrary to this popular practice, it was recently discovered that frequent removal of the floor litter may be self-defeating and that the better sanitary procedure is the use of old built-up litter.

Following the discovery of the sanitary properties of built-up litter came the revelation of the nutritional properties which will be the primary consideration in this discussion.

BETTER HATCHABILITY OF EGGS

During the wartime scarcity of labor and litter material the Station, like many poultrymen, was obliged by necessity rather than choice to use old built-up litter. Necessity again, as in many other instances, led to another discovery that hens which received a deficient ration on old built-up litter produced eggs of good hatchability. Soon after it was demonstrated by a series of experiments that the eggs from hens that received the same deficient ration on the floor litter removed and renewed every two weeks were poor in hatchability.

EXPERIMENTS WITH HATCHABILITY OF EGGS

The first three experiments (1944, 45, and 46) were to determine the minimum requirements of animal feedstuffs such as fish, meat, and milk products, to supplement an all-plant diet for the production of eggs of good hatchability. In experiments two and three, it was discovered that the dietary requirements depend upon the management of the floor litter. Consequently, the succeeding experiments (4, 5, and 6) were designed to test the effects of different floor litter procedures upon the dietary requirements for the production of hatchable eggs.

The experiments were conducted with different groups each of 50 White Leghorn pullets mated to White Leghorn

*Presented at the Ohio Animal Nutritional Conference, Ohio State University, Columbus, November 10-11, 1949.

males rotated from pen to pen each week. Six to nine weekly settings of eggs were made each year from March to June with a total of about 1200 eggs from each group. The eggs were all pedigree-hatched. Some of the results with two floor litter procedures follow:

Basal ration* with	Exp. No.	Ave. percent fertile eggs hatched	
		Fresh litter	Built-up litter
5% Alfalfa meal**	4	33	78
	5	33	64
5% Alfalfa meal** 2.5% dried whey	4	56	80
	5	68	85
5% Alfalfa meal** 2.5% dried whey 2.0% meat scraps	4	68	80
	5	77	85
5% Alfalfa**	6	14	73
Riboflavin***	6	41	83
5% Alfalfa** Riboflavin***	6	33	86
5% Alfalfa** Riboflavin*** 2.0% meat scraps	6	71	86

*Composed of corn, oats, wheat bran and middlings, soybean oil meal, bone meal, oyster shells, salt, manganese, and vitamin A and D feeding oil.
**Dehydrated 17% protein.
***0.9 milligrams per pound of feed.

In no instance were the breeders on fresh litter able to produce eggs of good hatchability from any of the diets used in these experiments, whereas all of the diets (except the basal ration with alfalfa only) yielded eggs of 80 percent or better hatchability from the breeders on built-up litter. Obviously, the failure of the breeders on fresh litter to produce hatchable eggs was due to deficiencies of riboflavin and the animal protein factors. There was, evidently, a mild deficiency of riboflavin in the built-up litter that was nearly corrected by the alfalfa. However, no deficiency of the animal protein factors was indicated in any of the diets when the breeders were on built-up litter.

The early experiments in which increased hatchability of eggs was secured from deficient diets when the breeders were on built-up litter suggested that in view of the similarity of the nutritional factors essential for growth and reproduction, the discovery might likewise apply to the growth of chickens. Then followed six consecutive experiments during the past two years with the growth of a total of 5,700 chickens.

EXPERIMENTS WITH THE GROWTH OF CHICKENS

In most instances the number of chicks in each brooder unit was around 200. Electric lamp brooders were used with supplemental heat during cold weather from hot water pipes on the rear wall of the brooder house. The experiments were conducted with Leghorn males and R.I. Red females crossbred (mixed sexes) for periods of 12 to 16 weeks each summer, winter, and fall. Three floor litter procedures were included:

1. Old built-up litter used for one brood after another.
2. New built-up litter started fresh with each brood of chickens.
3. Fresh litter removed and renewed every two weeks.

The results of experiments 3, 4, and 5 at the end of 12 weeks were so consistently the same that only the averaged results of the three experiments need to be used to tell the story.

Ration	Floor litter	Weight per bird	% Mortality
Complete*	Old built-up	2.45 lbs.	5
	Fresh	2.30	7
Incomplete**	Old built-up	2.34	7
	New built-up	1.88	18***
	Fresh	1.64	23***

*Composed of corn, wheat bran and middlings, soybean oil meal, 5 percent dehydrated alfalfa meal, 17 percent protein, 7 percent meat scraps, 5 percent dried whey, oyster shell, salt, manganese, and vitamin A and D feeding oil.

**Same as complete without meat scraps and dried whey, with corresponding amounts of soybean oil meal and bone added to make the protein and phosphorus the same for both rations.

***Due largely to coccidiosis.

The complete ration gave the better rate of growth in each of the three experiments when the birds were on the old built-up litter, although there was little difference in the rate of mortality. It was with the incomplete (all-plant) diet where there was a critical deficiency to be corrected that the results in favor of the old built-up litter were pronounced both as to rate of growth and reduced mortality. It is noteworthy that the rate of growth of the birds that received the incomplete (all-plant) diet on old built-up litter was equal to that of the birds that received the complete diet on fresh litter.

The reduced rate of growth of the birds that received the incomplete diet on old built-up litter in some instances indicated a mild deficiency of riboflavin. This suggested that the

incomplete all-plant diet might be supplemented by dried whey or riboflavin and yield a rate of growth comparable to that of the complete ration. The results to this effect from experiment 6 follow:

Ration	Litter	Weight per bird	% Mortality
Complete*	Old built-up	2.28 lbs.	4
	New built-up	2.25	5
Incomplete*	Old built-up	2.31	4
	New built-up	1.97	14
Incomplete* 2.5% dried whey	Old built-up	2.30	4
Incomplete* Riboflavin**	Old built-up	2.46	2

*Same as in experiments 3, 4, and 5 preceeding.
**1.3 mg. per pound of feed.

It appears in this experiment that the old built-up litter provided ample riboflavin to supplement the incomplete (all-plant) diet since the rate of growth of the chickens on this diet was much the same as that of the chickens which received the complete ration and the riboflavin supplements. Although the chickens that received the incomplete ration supplemented by riboflavin made a slightly better rate of growth, it may or may not have been due to the riboflavin. Repeated experiments will be necessary to determine the role of supplemental riboflavin in connection with old built-up litter. In no instance, however, has there been an indication of any deficiency of the animal protein factors including B_{12} when the chickens received the incomplete (all-plant) diet on old built-up litter.

DIET FOR EGG PRODUCTION DETERMINED BY THE FLOOR LITTER

Upon completion of experiment 4 at the end of 14 weeks in December 1948, four groups each of 40 September hatched Leghorn-R.I. Red crossbred pullets were transferred to a laying house and continued as previously in the brooder house on the same rations and floor litter procedures as follow:

1. Complete ration and fresh litter removed and renewed every two weeks.
2. Complete ration and old built-up litter.
3. Incomplete (all-plant) ration and old built-up litter.
4. Incomplete (all-plant) ration with an equal amount of whole grain, (equal weights of corn, wheat, and oats) fed on old built-up litter.

The pullets that received the incomplete ration on fresh

litter were not included because of their unfit condition for the extended experiment. The four groups of pullets started to lay in late February and the results of this experiment to October 1, 1949, follow:

Group number	Egg Production 7 months	Ave. Weight per bird	Mortality since December, 9 mo.
1	61 pct.	4.30 lbs.	20 pct.
2	61	5.30	22
3	65	5.20	22
4	64	5.46	26

While the egg production and mortality of groups 1 and 2 which received the complete ration were practically the same, there was a marked difference in the monthly weight of the pullets on fresh litter. These pullets were underweight, when transferred from the brooder to the laying house and remained underweight during the 7 months of egg production.

What group 3 did with the incomplete (all-plant) ration on the old built-up litter was a far reaching discovery in that the built-up litter adequately provided these pullets the necessary supplemental riboflavin and animal protein factors including B 12 for normal growth during the first five months and for 65 percent egg production during the seven months to follow. The results of this experiment were likely the first recorded instances of this notable accomplishment.

Still more remarkable was the performance of the group 4 pullets which were fed and managed the same as group 3 until the end of the first 14 weeks when group 4 was given about an equal amount of whole grain (equal weights of corn, wheat, and oats) on the old built-up litter in addition to the 17 percent protein incomplete (all-plant) diet. In other words, group 4 pullets received the incomplete ration diluted one half by whole grain with a protein content of approximately 13 percent of the total feed intake. Despite this high grain, low mash, and low protein intake, the performance of group 4 pullets was equal to that of group 3 after they were transferred to the laying house at the age of 14 weeks. How were these birds able to develop into ready-to-lay pullets at the end of five months and maintain an average of 64 percent egg production the following seven months under these circumstances? Further research will be necessary to deal with this pertinent question. During the meantime, it presents much food for thought.

Thus each consecutive experiment has continued to unfold the magic of old built-up litter in brooder and laying houses.

First, it came as a wartime necessity to save labor and litter material during which it was found to be a sanitary procedure for the prevention or control of certain diseases, especially coccidiosis. Then came the nutritional discoveries in connection with the synthesis of riboflavin and the animal protein factors including B_{12} in built-up litter. This has permitted the production of eggs of good hatchability and growth of chickens on all-plant diets when the chickens were on old built-up floor litter. What will be next? Certainly the story has only begun to unfold.

LACTOSE IN A PURIFIED DIET CUTS EGG PRODUCTION

Lactose, or milk sugar, in hens' purified diets may make them stop egg-laying in as little as four days. J. R. Couch, V. H. Barki, M. L. Sunde, W. W. Cravens, and C. A. Elvehjem discovered that when they used a ration with lactose as the only carbohydrate and making up about 65% of the purified diet.

Leading up to the discovery were earlier results in which 15% lactose in a purified diet reduced egg production in about three weeks.

When the 65% lactose diet was supplemented with 30% fat, however, egg production was normal. Butter oil, at a 3% level, fish solubles, and dessicated thyroid were of no value; 5% whole liver powder helped a little.

Earlier experiments have shown similar results with rats —that adding fat to diets containing no carbohydrate except lactose overcomes the bad effects of the lactose.

The workers believe the fat may either slow the absorption of galactose and prevent a flooding effect of this sugar, or aid in the metabolism of the galactose after it reaches the blood stream. (Western Condensing Co. support.) (From annual report, bulletin 489, Wisconsin Agricultural Experiment Station, Madison, Wisconsin.)

MORTALITY OF CHICKS AS AFFECTED BY THE FLOOR LITTER

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Prevention or control of coccidiosis has centered around the frequent removal of the floor litter, which has been considered as an axiomatic, sanitary procedure, despite its failure to accomplish the purposes expected. That this procedure may be self-defeating has been indicated by extensive experiments conducted by this station in which more effective growth and prevention or control of coccidiosis was realized by the growth of chicks on old built-up floor litter.

Beach and Corl (1925), Johnson (1927 and 1932), Tyzzer (1929), and Farr (1943) have cited conclusive evidence to the effect that chicks can acquire resistance or immunity to coccidial infection through repeated light exposures to sporulated oocysts. This may be one reason for the inhibiting effect of old built-up floor litter on the incidence of coccidiosis, since the day-old chicks in the Ohio Station's experiments were started on the old built-up floor litter used by previous broods of chicks. Old built-up floor litter may, conceivably, also provide a favorable environment for the growth of microorganisms directly inimical to the coccidia, or the coccidia may be ill affected by the ammonia developed in the old litter.

The New Jersey Agricultural Experiment Station (1943) reported that the use of hydrated lime in the floor litter served as a preventive of the spread of coccidiosis. At the Ohio Station, chicks were brooded and raised in adjoining pens on built-up floor litter with and without hydrated lime. Practically the same growth and low rate of mortality were secured in each pen from three consecutive broods of chicks. Koutz (1948) presented data from four experiments which indicated that hydrated lime mixed in deep litter did not prevent oocysts of *E. tenella* from sporulating and was no more effective than deep litter alone in preventing coccidiosis.

EXPERIMENTAL

The experiments reported at this time were conducted in a brooder house of 10 pens, each containing 150 to 250 chicks. Each pen was provided with an electric-lamp brooder

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and supplemented during cold weather by heat from hot-water pipes on the rear wall. Three to four different broods of chicks were started each year and continued for periods of 8 to 16 weeks each. Consequently, the built-up floor litter was kept in almost continuous use. Weights of the chicks and feed consumption were, in most instances, recorded each two weeks, beginning with the fourth week of age. Mortality was likewise recorded. The chickens consisted of Single Comb White Leghorns, Rhode Island Reds, and Leghorn x Rhode Island Red crossbreds.

The Rations. The complete ration was considered adequate for the satisfactory growth of chickens indoors. The "incomplete" ration, being an all-plant diet, was deficient in riboflavin, the unidentified animal protein factor(s), and possibly other factors necessary for the normal growth of chickens indoors.

Management of the Floor Litter. The old built-up floor litter was that used for previous broods of chicks, whereas the new built-up floor litter was fresh, beginning with a given brood of day-old chicks and continuing without removal 8 to 16 weeks, or to the end of the experiment. The litter was stirred and additions of fresh litter and or hydrated lime were

TABLE I

Percentage Mortality of 10 Broods of Chicks from All Causes during the Starting Period When Floor Litter Was Removed and Renewed at Frequent Intervals Previous to the Use of Built-up Floor Litter

Date Hatched	Kind of Chicks	Number of chicks	Weeks in brooder house	% mortality		
				First 4 weeks	After 4 weeks	Total
Feb., 1943	R.I. Red pullets	1721	12	12	3	15
May, 1943	Leghorn pullets	1800	12	7	3	10
Sept., 1943	Leghorn pullets	1929	16	22	17	39
Mar., 1944	R.I. Red pullets	2051	10	28	8	36
May, 1944	Leghorn and R.I. Red pullets	2258	12	9	7	16
Sept., 1944	Leghorn pullets and cockerels	2006	16	11	11	22
Feb., 1945	R.I. Red pullets	1438	12	5	4	9
May, 1945	Leghorn, R.I. Red cockerels and pullets, Leghorn x R.I. Red cockerels and pullets	2300	9	14	6	20
Aug., 1945*	R.I. Red cockerels and pullets, Leghorn x R.I. Red cockerels and pullets	1646	16*	4	7	11
Feb., 1946†	R.I. Red cockerels and pullets	1586	12†	12	3	15
	Totals	18,735		12	7	19

*Hydrated lime was used for the first time after removal of the floor litter at the end of 6 weeks.

†This was the first time the same floor litter with lime was used during the entire period (12 weeks) in the brooder house.

made from time to time to both the old and the new built-up litter as needed to keep the litter in good condition. The fresh floor litter was removed and renewed each 2 weeks. The litter material, in all instances, was started with 2 to 3 inches of wood shavings.

RESULTS AND DISCUSSION

Serious losses of chicks were experienced from coccidiosis and other diseases when the floor litter was removed and renewed at frequent intervals, and losses were reduced from an average of 19 per cent before to 7 per cent after the use of built-up floor litter (Tables 1 and 2). The rates of mortality of the last brood recorded in Table 1 and the first two broods recorded in Table 2 indicate that it requires two or three broods of chicks, or the continuous use of the floor litter (at the rate of one bird to each square foot of floor space) for 9 to 12 months, before the full beneficial effect upon the livability of chickens can be realized.

TABLE 2

Eight Consecutive Broods of Chicks Fed Complete Ration on Same Built-up Floor Litter with Hydrated Lime

Brood No.	Date	Duration of experiment	Kind of chicks	Number of chicks	% mortality—all causes
1	5-15 to 7-12, 1946	8 wks.	Leghorn pullets	1383	17
2	10-30 to 12-26, 1946	16 wks.	R.I. Red cockerels and pullets	350	10
			Leghorn x R.I. Red cockerels and pullets	400	10
3	2-12 to 5-6, 1947	10 wks.	R.I. Red pullets	1100	7
4	5-7 to 7-15,1947	10 wks.	Mixed Leghorn x R.I. Reds and crossbreds	1420	8
5	8-12 to 12-2, 1947	16 wks.	Leghorn x R.I. Red cockerels and pullets	360	4
6	3-16 to 5-26, 1948	10 wks.	R.I. Red cockerels and pullets	1800	3
7	6-1 to 8-24, 1948	12 wks.	Leghorn x R.I. Red cockerels and pullets	127	6
8	9-1 to 12-8, 1948	14 wks.	Leghorn x R.I. Red cockerels and pullets	200	2
			Total and average	7140	7

In three of the four experiments (Table 3), the mortality of the chicks was less on old litter.

TABLE 3

Old. vs. New Built-up Floor Litter with the Complete Ration

Exp. No.	Kind of chicks	Old built-up floor litter		New built-up floor litter	
		Number of chicks	% mortality all causes	Number of chicks	% mortality all causes
1-16 wks.	R.I. Red cockerels	150	15	150	39
	R.I. Red pullets	200	6	200	12
2-10 wks.	R.I. Red pullets	500	4	500	6
3-16 wks.	Leghorn x R.I. Red cockerels and pullets	360	4	200	2
4-14 wks.	Leghorn x R.I. Red cockerels and pullets	200	2	250	7
	Totals and averages	1410	5	1300	10

It was when the chicks received the incomplete ration (Table 4) that the effects of the different kinds of floor litter upon the amount of mortality were pronounced.

TABLE 4

Old Built-up Floor Litter vs. New Built-up Floor Litter and Fresh Litter Removed and Renewed Each 2 Weeks, Incomplete Ration

Exp. No.	Total Number of birds	% Mortality—all causes		
		Old built-up floor litter	New built-up floor litter	Fresh litter each 2 weeks
1	810	4	21	14
2	900	6	20	20
Total and Average	1710	5	20	17

The high degree of mortality of the birds on new built-up floor litter and on the fresh litter removed and renewed each 2 weeks occurred after the first 4 weeks. The gross symptoms indicated coccidiosis. At the end of Experiment 2, four of the least thrifty birds were taken from each of the 10 pens and autopsied. Coccidia were demonstrated by microscopical examination* in 80 per cent of the birds from 5 pens with old built-up litter (the same litter had been used by four or seven consecutive broods previously) and in 94 per cent of the birds from the 5 pens in which there was new built-up floor litter or litter renewed each 2 weeks. In other words, coccidia-infested birds were present in all pens, irrespective of management of the floor litter.

SUMMARY

That old built-up floor litter may function to lessen the loss of chicks from coccidiosis and other diseases was evidenced by the fact that the overall losses were reduced from an average of 19 per cent, when the floor litter was removed at

frequent intervals, to 7 per cent, after the use of built-up floor litter.

In three experiments in which a complete ration was used, fewer chicks were lost on old built-up floor litter than on new built-up floor litter.

In two experiments in which the chicks received an incomplete ration, the mortality of groups on different types of litter became pronounced. The birds on the old litter made satisfactory growth with low mortality, whereas those on new built-up or fresh floor litter did not.

The improvement in growth and the reduction in mortality observed in groups of chickens raised on old built-up litter indicates the urgent need for fundamental research relative to the chemical and biological processes (and their products) that take place. If this need is emphasized to research workers, the primary purpose of the paper will have been achieved.

*Autopsies were made by Dr. W. L. Ingalls, Veterinary Clinic Laboratory, Ohio State University, Columbus, Ohio.

REFERENCES

Beach, J. R. & J. C. Corl. 1925. Studies on the control of avian coccidiosis. Poultry Sci. 4: 83-93.
Farr, M. M. 1943. Resistance of chickens to cecal coccidiosis. Poultry Sci., 22: 277-286.
Johnson, W. T. 1927a. Avian coccidiosis studies. Proc. World's Poultry Cong. Ottawa, Canada. 330-332.
Johnson, W. T. 1927b. Immunity or resistance of the chicken to coccidial infection. Oregon Agr. Exp. Station Bull. 230: 1-31.
Johnson, W. T. 1932. Immunity to coccidiosis in chickens produced by inoculation through the ration. J. Parasitol. 19: 160-161.
Koutz, F. R. 1948. Immunity studies in avian cecal coccidiosis. Poultry Sci. 27: 793-797.
New Jersey Agr. Exp. Station. 1943. Bull. 707.
Tyzzer, E. E. 1929. Coccidiosis in gallinaceous birds. Am. J. Hyg. 10: 1-115.

The *Egyptian Government* is attempting to encourage *poultry keeping* to prewar levels by paying subsidies to hatcheries. The annual subsidy is approximately $14.35 for each incubator in operation prior to January 15, 1942, and an additional payment of 1/3 of a cent is made for each chick above the previous year's output.

Egyptian output of chicks had decreased 50 percent by 1949 from the 80 million chicks hatched in 1939. Of the 764 incubators in operation in 1939, only 410 were still functioning in 1949.

POULTRY INDUSTRY IN THAILAND

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The history of poultry raising here is very old. In fact, it is as antiquated as the history of the Thai people themselves. However, the commercial duck raising industry and the few modern poultry flocks are of recent origin.

Since poultry are not included in the past agricultural censuses of Thailand, the exact poultry population of this country is not definitely known. However, the writer is of the opinion that the conservative estimates of same are as follows.

chickens	5,000,000
ducks	1,500,000
geese	200,000
pigeons	10,000
turkeys	1,000

Breeds. In former days only three native breeds of chicken were kept in this country, namely, the Aseel or fighting breed, kept for fighting purposes, the Cantonese breed kept for egg and meat and the "Kai-Jay" or fancy breed kept for pleasure and for jungle-fowl-catching sport. Many farmers living near the edge of the jungle have been using the males of the "Kai-jay" as decoys to catch the males of the jungle fowls who will come to defend their domain against the intruders as soon as they hear the crowing challenge of the domestic birds, thereby getting themselves caught in the snares set up along their paths by the farmers. The "Kai-jay" and the jungle fowl are very similar in size, appearance and voice. To my mind the "Kai-jay" breed is the nearest domesticated descendants of the jungle fowl and they are as alike as two pea seeds and are known to interbreed readily.

During recent years, especially after World War II many modern breeds of poultry such as the Single Comb White Leghorns, the Rhode Island Reds, the Barred Plymouth Rocks, the Australorps and others, have been introduced into the country from the United States of America and Australia.

Consumption. All Thai people enjoy eating hen eggs and chicken meat. There are many native recipes to prepare them for the table, the most popular of them all being the chicken curry and the barbecued or roasted chicken. Capon meat is also very popular. There are many Chinese restaurants in

Bangkok serving capon meat with rice specially cooked in capon fat. This recipe is called "Rice and capon" and is very well-known and enjoyed by American residents.

Marketing. Bangkok market is the center of the poultry trade. Birds of all ages from nearby provinces are sent there alive by road, rail or river to supply the city's need. Birds are sold alive or freshly dressed. There is no frozen poultry trade. In the southern part of Siam, the surplus is exported into Malaya markets.

Most of the eggs sold in the market are duck's. This is because ducks are raised on a commercial scale and about 200,000-300,000 eggs are laid and collected—daily—thereby forming the major part of the egg trade. At present there is not enough supply of hen eggs to meet the local demand. Before the war Thailand started exporting duck eggs to Singapore.

Types of poultry farming. Except for a few modern or semi-modern small poultry farms set up during the last one or two years, there are no really commercial poultry farms in Thailand. The poultry meat and eggs sold are all from the farm poultry which the farmers keep either as a side line or as a cock fighting sport.

Be it said here that the cock fighting sport, although considered cruel in the modern eyes, are still useful as a means of extension work to encourage the people to grow chickens and every bird raised will eventually go to the cooking pot. When the poultry education is extended to them, eventually the farmers will accept the modern method of poultry raising and give up the cock fighting sport willingly. Besides why should the farmers be deprived of their useful enjoyment when city people still enjoy boxing which to the eyes of the farmers are just as, or even more cruel than, cock fighting. In fact the poultry supply in Thailand comes mostly from the fighting breed.

Poultry Management. The general method of incubation used by the farmers is the natural incubation or the hen hatched method. But in Bangkok artificial incubation is also practiced, using the Chinese method. There are about 20 chinese hatcheries, each with about 20,000 egg capacity in the capital and a few more in the different duck raising provinces. Almost all the ducklings raised by the commercial duck growers are hatched from these old Chinese hatcheries. These are very crude when compared with the modern mammoth incubators but the result is satisfactory, giving about 60 per cent

hatch of all eggs set.

Many small poultrymen are now using the modern incubators, both hot water and electric types. A few are imported from America and Australia and some are built locally.

Where natural incubation is used, natural brooding is also practiced, while with those preferring artificial incubation, artificial brooding is chosen.

For the general farmers as a whole, there is no set system of feeding. The birds will eat what they can find and what is available on the farm, which may consist of white ants, insects, rough rice and broken rice, either singly or in combination. In the case of duck raisers, rough rice bran is the basic ration, with fresh fish or fresh clams as protein supplement. The modern poultrymen are using the same feeding system as practiced elsewhere, namely feeding their birds a dry mash mixture having a nutritive ratio of about 1:4.5.

The housing in use in this country varies from the treetops in the case of some farmers to up-to-date houses, in the case of modern poultry raisers. The housing problem in Thailand is simple to solve. The idea is to have them cool, and give good protection from sun, wind and rain. No insulation is needed.

In the case of the fighting cocks, the farmers are very skilful in breeding and are able to get superior fighters. But they do not bring the system in to use with the breeding of ordinary chicken. Hence, the general run of birds are poor both in egg production and growth. However, the up-to-date poultrymen are very keen in improving their flocks and are quite skilful in the breeding as judged by the egg laying contest results.

The fighting breed can lay about 80-100 eggs a year, while the laying breed can lay up to 150 or more if well fed. The modern breeds can lay 200 eggs or more.

In the fifth small egg laying contest run by the Central Agricultural Experiment Station, the average yearly production was 186 eggs and the high bird laid 280 eggs, more than half laying over 200 eggs in 12 months.

According to the commercial duck raisers, the average production for their ducks is around 200 eggs per year.

Lack of interest and trained men is the major obstacle to modern poultry industry in Thailand. The second drawback is the abundance and seriousness of diseases, chief among which are Newcastle, fowl cholera, infectious bronchitis and parasites. At present some new vaccine is being introduced by the

Department of Animal Husbandry, which, if successful, will do much to improve the interest in poultry raising. Lack of good laying and good paying strains of birds is the third factor. However, this will be gradually solved because many superior strains such as the Dryden and the Hanson strains and others have been introduced, multiplied and distributed.

Not much research work in poultry is done in this country. The young College of Agriculture has been trying to test the different kinds of rations used, has tried different breeds and strains most adaptable to Thailand conditions, and has also tried to find out the possibility of raising chickens in batteries by using sunlight throughout the year in place of cod liver oil.

There are great possibilities in Thailand for the future. Having sunlight all the year round, no winter, plenty of labor and land available, and the ability to grow any amount of poultry feed needed and also having ready local and nearby markets are the favorable factors which only few countries can enjoy.

Dr. Morley A. Jull (left), Head of the University of Maryland poultry department being presented with a teaching award certificate by Mr. Peter Chichester, a member of the Board of Regents. Students, alumni, and members of the staff named Dr. Jull as the most outstanding teacher in the College of Agriculture of the University of Maryland. Dr. Jull is a member of Council of the World's Poultry Science Association and a member of the Publication Committee of the World's Poultry Science Journal.

FATTENING POULTRY

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A series of experiments was started at the Government Poultry Institute in 1946. The purpose of these investigations was to determine whether the usual method of fattening young chickens could be improved with regard to both growth and market grade. Three of the experiments, reported here, deal with this subject, examining the effect of methyl-thiouracil and oestrogens in fattening rations for poultry.

Experiment I—Fattening White Leghorn-cockerels by administration of 4-methyl-2-thiouracil and diethylstilboestrol.

The effect of methyl-thiouracil (m.t.) and diethyl-stilboestrol (d.s.) as fattening agents on White Leghorn-cockerels was examined during an eight weeks trial.

The initial m.t. level being 1,4 mg per 100 gm of feed, was raised to 50 mg per 100 gm of feed after 30 days.

When this higher level was fed to cockerels in battery cages in a fattening diet containing grains and buttermilk it stimulated growth, decreased shrinkage and resulted in a greatly improved market grade of the carcasses.

The effect was of less significance when m.t. was given at the same level in a chick-starting ration to cockerels having access to grass.

Evidently the amount of d.s. (1,4 mg per 100 gm of feed) has been too small to obtain a marked effect on fattening.

Experiment II—The dosage of 4-methyl-2-thiouracil for fattening North Holland Blue chickens.

In this experiment, where 540 North Holland Blue broilers (cockerels and pullets), aged about 10 weeks and of moderate vitality, were used, the optimum period for fattening on a diet with ground grains and buttermilk was about 10 days (between 7 and 14 days). A distinctly improved market grade, finding expression in an increased percentage of first-rate and good chickens—but males only—was obtained if circa 25 mg methyl-thiouracil (m.t.) per 100 gm dry meal was fed at the least. The females showed no effect in this respect in contrast with the following experiments (f.i. Experiment III). When 50 mg was used instead of 25 mg per 100 gm dry meal and the birds were killed after one or two weeks the favorable effect was certainly not higher; neither was the influence on

the useful effect of fattening (initial weight — dressed weight[1])) when the drug was used at a level of more than 25 mg (by decline of growth). The effect of 10 mg or less did not influence the quality. The conclusion of this experiment was that for the North Holland Blue broilers circa 25 mg m.t. per 100 gm dry meal may be the optimum dose.

The useful effect of m.t. on market grade was lost entirely when the fattening period was extended over too long a period.

Chemical examination of muscle and skin samples and weighing of the abdominal fat of carcasses of different grade in external appearances, did hardly result in any relation between grade and the percentages of fluid and lipids in muscles and skins, but in the higher grades the abdominal fat deposition, expressed in percentage of dressed weight, was higher.

Experiment III—Fattening North Holland Blue pullets by administration of 4-methyl-2-thiouracil and hexoestrol dimethyl ether.

The effect of methyl-thiouracil (m.t.) and hexoestrol dimethyl ether (d.h.) on 48 North Holland Blue pullets, aged about 4 months and fattened in batteries with ground grains and water for 10 days was examined at a level of 50 mg and 75 mg resp. per 100 gm dry meal mixed with the ration. With the existing variation of the material and the rather small number of birds per lot (16) a possible influence on feed consumption, growth and shrinkage could not be proved with any passable statistical certainty.

A slightly increased shrinkage because of using the drugs is not out of the question, whilst the m.t. may have caused some retarded growth. It is fairly certain that this drug has lowered the useful effect slightly, but on the other hand it produced a distinctly improved market grade.

As for a possible influence of the d.h. on useful effect and grade the results of the experiment point to the same direction, but to a less extent and therefore they are less reliable, especially according to the useful effect.

Unpublished data of a following experiment with older and more vital North Holland Blue chickens (approximately 3½ months old) showed that for these animals 50 mg m.t. had a better effect on the market grade than 25 gm per 100 gm dry meal.

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[1]) dressed weight = blood, feathers and intestines removed.

THE PROGRAM FOR CONTROLLING RESPIRATORY DISEASES OF POULTRY IN CONNECTICUT

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Infectious bronchitis and Newcastle disease are the most widespread respiratory diseases of chickens in Connecticut and often responsible for high chick mortality and severe loss in egg production. There is no effective treatment at the time of an outbreak. For this reason an experimental immunization program was started for bronchitis in 1946 and for Newcastle disease in May 1948. The results are summarized below.

According to the available data 58 flocks were immunized for bronchitis, 112 for Newcastle disease, and 45 flocks for both, in 1948. The results of the immunization program were reported as "good" for bronchitis in 92% with little mortality; for Newcastle disease in 93% with an average mortality of 0.57%, of all lots or age groups under observation. No reports were received in about 30% of the cases which usually means no unfavorable results. No takes were reported in 8% which probably indicates natural exposure to the disease prior to immunization.

The Program outlined herein is voluntary, experimental, and free of charge at present. It is designed primarily for the breeder and egg producers as an insurance against the hazards of the most prevalent respiratory diseases. There exist other unknown respiratory troubles. Probable results can be predicted only on the basis of past experience.

Broiler immunization is under investigation but has not been tried under field conditions. A laboratory diagnosis should be obtained for every respiratory disease outbreak. It is visualized that by knowing the prevailing disease on the farm it might be possible to immunize subsequent lots if obtained from immune parent stock, for either bronchitis or Newcastle disease at 3 weeks of age. Such immunization is believed to be of limited duration.

Certain Principles should be followed even if the program is to be modified to meet individual needs: 1) immunize only healthy vigorous birds; 2) obtain chicks from known bronchitis and Newcastle immune parent stock in order to get natural protection for the first 3 to 4 weeks; 3) plan flock immunization for the entire year in advance. Successive lots

of replacement chicks should be immunized at the recommended age; 4) immunize for both bronchitis and Newcastle disease; also for fowl pox and laryngotracheitis, if the premises were so infected the year before; 5) avoid having susceptible and immunized birds on the same farm; 6) keep the premises sanitary and the different age groups isolated.

For smooth working the cooperation of three agencies is essential; you, as Poultrymen, the Laboratory for diagnosis and vaccine production and the Department of Farms and Markets for general supervision and field work, with its pullorum blood testers as the principal intermediaries.

To get on the program obtain from one of the above Departments, blood testers or county agents, application forms for bronchitis (green) and Newcastle (blue), fill out in triplicate stating *all groups by ages separately*, and return 2 copies to Department of Farms and Markets. *Apply early* and *state the week* when you wish to have your various age groups immunized. The blood tester will then come to your farm for test bleeding and or to *show you* how to apply the immunizing products. *Report* on return card *all* results good or bad, promptly and accurately.

To avoid complications from coccidiosis during the immunization period brooder chicks should be treated with standard sulfa drugs intermittently or preferably fed continuously a medicated mash such as one containing 0.01 to 0.0125% sulfaquinoxaline.

In case of respiratory disease in immunized flocks or chicks therefrom, or unusually long duration of the immunizing disease, please submit live specimens promptly for laboratory diagnosis.

Immunizing products should be stored *under refrigeration*, kept cool during use, and applied before expiration date.

Bronchitis immunization is suggested at the age of 6 to 8 weeks, if a) the old birds have been shown to be immune by laboratory tests, or b) old susceptible birds are in a molt or to be soon disposed of, or c) there are no other chickens on the place. About 5% of the birds in each group are swabbed in the throat with the virus. For the next 3 weeks the houses should be kept extra warm and humid. In large flocks virus may be applied by *spray on special request*. Signs of "cold" should appear within 3 to 7 days, and disappear within 14 to 21 days, after inoculation. Other methods of immunization are under study.

INFECTIOUS BRONCHITIS

Year	Total Number Vaccinated: Flocks	Lots	Birds	Flocks Year on Program: 1st	2nd	3rd	Av. Age At Vacc. Days	Av. Dur. after Days	Results by Lots: Good	Fair	Poor	Not Take	Not Stated
1946	14	21	57,150	14			107	28	16		1	2	2
1947	58	101	207,633	46	10		92	18	60		1	18	22
1948	103	124	369,065	70	24	9	92	14	67	8	1	5	43
Total	175	246	633,849	132	34	9			143	8	3	25	67

NEWCASTLE DISEASE

1948	157	195	548,541				115		113	6	2	10	64

Newcastle disease vaccination is suggested at the age of 10 to 12 weeks preferably if the old birds have been shown to be immune. Under reasonable precautions no spread to other age groups is observed. The vaccine is applied by the wing web puncture technique. If desired fowl pox vaccine may be applied simultaneously, by adding dry powder fowl pox vaccine to liquid Newcastle vaccine in the ratio of 1:2 doses. Laryngotracheitis vaccine has been applied in the cloaca at the same time with no unfavorable results. Fowl pox and *laryngotracheitis vaccines* are to be obtained from commercial sources, the latter *under a permit* from the Department of Farms and Markets. For Newcastle vaccination every bird should be stabbed with a freshly dipped needle. Newcastle vaccination takes should be visible between the 3-8th day post-vaccination in the form of a raised smooth pimple around the wing web puncture. Fowl pox vaccine takes appear between the 7-14th day and are definitely scabby.

Laryngotracheitis takes are observed on the 4-5th day in the form of reddening and swelling of the inner membrane of the vent.

HI! COME TO CHINA WITH ME!

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Let's take a look at some historical high points in China's poultry. Chickens domesticated in China were brought from southern Asia. These were generally believed to have descended from Gallus bankiva, the jungle fowl of India. Domesticated chickens were kept in China at least as early as 1400 B.C.

Domestication was not the only part of the poultry industry which came early in China. It was the Chinese who first invented the method of heating eggs with charcoal as an artificial incubation procedure. It has been practiced for generations by the natives of Tungshangfu, in Shantung province. Operators of these commercial hatcheries are employed on a contract basis with the company advancing enough money to maintain the operator's family during his absence and paying his and his apprentice's expenses during the hatching period. The operator, in turn, guarantees the hatchery a hatch of 85 percent. At the end of the hatching season, the operator receives 1/20 of the net profit. The incubator itself is but a crude "Kang" (earthen bed) or wooden barrel or basket. In packing this "Kang," a layer of eggs is alternated with a layer of heated rice or heated wheat until it is filled. One's sensitive eyelids serve as the incubator thermometer. The natural sunlight is used to candle the eggs. In spite of such primitive methods, the result seems good so far.

Some superstitions of the uneducated dealing with poultry are as follows:

1. If a cock crows at midnight instead of at the regular time of daybreak, it foretells a bad omen to that family so that the cock is sure to be killed for the table the next morning.

2. If a hen crows or a cock cackles, it denotes that something bad will happen to that family. Both of them are to be killed immediately for eating.

3. Whenever any chicken flies onto the roof of a human's dwelling, it indicates that the house is in danger of having a fire. The bird is to be caught and killed at once.

4. When the chickens get high on a framework or tree, it indicates a rain storm or a flood condition.

Following are several beliefs of some common folks:

1. When a hen becomes broody, a certain number of eggs are set for natural incubation. The number of eggs set de-

pends upon the size of the hen, but the eggs must be odd in number in order to have a better hatch.

2. Dark brown-shelled eggs are believed to be more nutritious than the lighter brown or white-shelled eggs.

3. "Black-boned chicken" is supposed to be a drug for curing certain human disease.

4. Goose saliva is used as a remedy to cure children's disease.

5. One of the purposes of raising geese is to keep away the snakes which are afraid of goose manure. If it gets on the body of a snake, its flesh will rot.

Have you heard these expressions?

1. "Crippled goose" . . . means something wrong or imperfect. When one member of the family is not good or not successful, this expression is used to describe the situation.

2. "Yah to pu sen lih" . . . means "many ducks, yet no good." Although there are many members in an organization, yet they are not all active and helpful, the head may say "yah to pu sen lih," describing quantity but not quality.

3. "Roll eggs" . . . When one offends a person that he becomes so angry that he will say to the offender in a scornful way, "roll eggs," which means to go away or get out of my sight.

4. "Rotten egg" . . . "Chiuo Twei Tan" is a very expressive way to scold or to call a bad person.

5. "Goose egg-shaped face" . . . For any girl, this is considered as one of the qualities for a Chinese beauty.

Traditional customs of China's poultry producers are:

1. Poultry meat is always a great specialty for any festival and for the most honorable guest.

2. Chicken, ducks, geese, and hen's eggs are seasonal gifts among relatives and friends.

3. Fresh chicken eggs belong to the rich man's daily food or to the sick peoples' diets.

4. Salted duck eggs are the most common dish to go with rice, especially in the summer.

5. The lime-preserved duck eggs called "Bi tan" or "Song hwa tan" in China and known as "ancient eggs" in America, are served as one of the delicacies among the cold dishes in a feast. It is really not so old as so termed since only about three months pass after the processing.

6. Chicken eggs, boiled and dyed in bright colors, are sent to relatives and friends as announcement of a newborn baby. An odd number of eggs presented indicates a baby son, while

an even number designates a baby girl.

7. On the birthday of any child he or she is given two to three eggs to eat. They are usually poached in sweet-fermented rice soup, "Chiu meng tan."

8. When a son is leaving home for the first time to go to school or to start a business, he is usually given three to six eggs to eat that day. The number three stands for a scholarly title, Shang Yuen, and six stands for good luck or great success.

9. When a daughter marries—just before she is about to go from her mother's home into the "Bride's Chair" on the wedding day—she is fed eggs cooked or poached with a kind of dry fruit, "Draggon-eyes" (Kwei Yuen). It is a symbol for a happy prosperous life in her husband's home.

The typical breeds of chickens in China are of the Asiatic class, such as the Brahmas, Brahma Bantams, Cochins, Cochin Bantams, and the Langshans. However, the local birds are usually a "grand mixture" having various regional names such as "Yu Chi" (oil chicken) which exist in the vicinity of Peiping. Silkies are found to some extent in Kiangsu province, having a black skin and black bone "Do Gwoh Chi;" Sheokwang in Shangtun province which are black-spotted and known for their large-sized eggs; and Hsiaoshan in Chekiang province which is uniformly yellowish and are noted for their eggs and meat.

Some of the foreign breeds have been introduced more or less into China some of which are the White Leghorns, Barred Rocks, Rhode Island Reds, Dorkings, Sussex, and New Hampshires. These breeds are yet in the minority.

The best-known breeds of ducks are the Pekins and Nankings. The former are known for their excellent meat and white plumage, while the latter are known for their eggs and gizzards.

The geese breed of China is the so-called "Chinese," consisting of two varieties, the White Chinese and the Brown Chinese. The Whites predominate in northern China and Szechwan province with an annual egg production of 75-100 per bird. The Browns—in fact rather gray—are mostly in southern China in Chekiang and Kiangsu provinces and have an annual egg production of 40-50 per bird. The most characteristic feature is the presence of a knob on the head. They are rather noisy, but are excellent for roast meat and present a very graceful appearance with their long arched necks.

The Brahmas, "Gray Shanghai" came from China about 1840 via England to the United States. This breed was admitted to the American Standard in 1874. Cochins, "Cochin China," the Chinese Shanghai fowls came first to Great Britain and then to America in 1845. Langshans, "Black Langshans," were imported to England by the late Major Croad. They were known as "Croad Langshans" in England and became a standard variety in America in 1883. The White Langshans were admitted to America's Standard in 1893. Pekin ducks first arrived in America in 1873 and were known for their fast growth on a Long Island duck farm, as well as for their fairly good-sized white eggs.

EGGS: PER CAPITA CONSUMPTION IN SPECIFIED COUNTRIES, SELECTED RECENT YEARS

Country	Year	Per capita consumption
		Eggs
Argentina	1947	127
Australia	1947	240
Austria	1949	61
Canada	1949	252
Cuba	1946	48
Czechoslovakia	1949	105
China	1946	48
Denmark	1949	150
France	1947	140
Finland	1949	75
Greece	1949	65
Italy	1949	98
India	1949	4
Ireland	1949	255
Netherlands	1949	150
New Zealand	1949	228
Sweden	1949	208
Switzerland	1949	165
United Kingdom	1949	106
United States	1949	376
Norway	1949	105

Compiled by the Office of Foreign Agricultural Relations, United States Department of Agriculture.

REARING CHICKS ON HOME GROWN FEEDING-STUFFS

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Muir (1947) in a paper read at the Berkshire Poultry Conference, has stated that chicks can be reared on a ration to which no protein has been added provided they have access to good grass. Two rations were suggested by him, one consisting of ground oats plus minerals, and one consisting of ground oats and a ground vegetable protein plus minerals, both to be fed with a grain ration of wheat.

The small experiment here described was designed to ascertain how successful the general farmer could be in rearing chickens on home grown foods and so be independent of chick food coupons. First crosses were used for the experiment, chiefly Brown Leghorn × Rhode Island Red, with a few Brown Leghorn × Light Sussex and Rhode Island Red × Light Sussex amongst them. On April 22nd 1949 a hatch of 192 chicks was divided into three equal groups. Group 'A' was fed on Sussex Ground Oats plus minerals, Group 'B' on Sussex Ground Oats, Bean Meal (tick beans) plus minerals, and control Group 'C' on a more normal rearing ration. Cod Liver Oil was included in all rations for the first ten weeks. The rearing was done in small 6 ft. x 4¼ ft. span roofed brooder houses each fitted with one 150 size pyramid hover and double burner oil lamps. These houses were placed on a ten year old ley of perennial rye grass and clover. The grass had been mown ten days beforehand and was in good condition for chick rearing. All mashes were fed dry with grain fed in the evening except to Group 'A.' which had grain morning and night because of the larger amount of grain allotted to this group. Water and grit were supplied ad lib. The rations for each group are shown in Table I. The chicks were allowed on to the grass in covered wire runs at ten days old and were moved daily. At three weeks the covered runs were removed and each brood was allowed to roam an area of 360 square yards bounded by portable netting three feet high. These pens were mown before being used by the chicks. It was felt that range would have been more desirable but this was impossible because of the danger of the chicks mixing and eating each others' rations.

TABLE I

Rations Used for Growing Chickens and Fattening Cockerels

Ingredients	Ration A No protein supplement	Ration B Vegetable Protein Supplement	Ration C Normal feed				Table Poultry Ration
			1-4 wks.	5-8 wks.	8-14 wks.	14 wks. and over	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Ground oats	28	14					
Steamed bone flour	½	(9 3/5 oz.)					
Manganized salt	(2 oz.)	(3 1/5 oz.					
Cod liver oil	(⅛ pt.)*	(⅛ pt.)*	(½ pt.)	(½ pt.)	(½ pt.)	(½ pt.)	(½ pt.)
Bean meal		14					
Fine offals			34	32	30	32	14
Maize meal			25	12	12	16	24
Sussex ground oats			12	8	10	7	
Potato flakes			8	22	23	21	25
Fish meal			8	8	7	5	9½
Barley meal				8	7	6	15
Grass meal			6	8	8	10	10½
Dried yeast			2				
Dried sep. milk			3				
Limestone flour			2	2	1	1	2
Mineral mixture**					2	2	
Flint grit					4½	3¾	
Grain	One half of daily ration	One-third of daily ration	2				
Broken or cut wheat				1	1	1	
Wheat			1				
Fine maize grits				1			
Maize grits					½	½	
Oats					½	½	
Barley							

*Given for first 8 weeks only.

**Limestone flour 4, steamed bone flour 2, common salt 2 (parts by measure).

The grass was again cut when the chicks were five weeks old. At eight weeks, all the chicks had to be penned in large permanent grass runs with five feet netting because the chicks in Group 'B' were always so hungry that it was impossible to keep all of them confined even in large runs fenced with wire netting, and during the five to eight week period a few chicks did visit their neighbors hoppers.

The chicks in Group 'B,' which were on the vegetable protein ration evidently found the bean meal extremely unpalatable as they were most reluctant to eat it. The sample of bean meal was changed for a freshly ground supply but this made no difference and consumption of mash was far too low and difficulty was found in maintaining the balance of grain to mash. During the final eight weeks, however, the birds seemed to find the bean meal mash much more to their liking and so consumption rose steadily.

Difficulty was also found in trying to persuade Group 'A' to eat sufficient wheat. The balance of half and half was not to the chicks' liking and despite two feeds of wheat per day sufficient was never eaten so the morning feed was dispensed with at eight weeks and the evening feed increased to the maximum of the chicks' appetites.

Group 'C' chicks were the most contented and the heaviest grazers, even although their mash contained 6 to 8 percent of very good quality grass meal. Group 'B' chicks ate hardly any grass and the grass in their run was soon out of control. Group 'A' were better grazers than Group 'B' but were unable to keep the grass down. The grass in all runs was cut on the same day but it was never really necessary in Group 'C.' These differences were most apparent during the first eight weeks when Group 'C' were growing fast, Group 'A' growing steadily and Group 'B' making slow progress. After this Groups 'A' and 'B' began to improve, food consumption to rise, until during the final period Group 'B' ate considerably more food than either of the other two groups. Grazing improved in Groups 'A' and 'B' as food consumption rose. Mortality was reasonably low in all groups, 'A' having five deaths, 'B' six deaths and 'C' seven deaths.

Table II (mixed sexes) demonstrates clearly how Group 'C' (normal ration) raced ahead of the others, especially Group 'B' (bean meal) so that at eight weeks the average weight per chicken in Group 'C' was 9.85 ozs. more than in Group 'B' and 8.26 ozs. more than in Group 'A' (no protein

supplement). At twelve weeks the differences in weight were not much greater but at sixteen weeks they were accentuated, and particularly between 'C' and 'A.' Also at sixteen weeks the average weight of the chickens in Group 'B' were for the first time heavier than those in 'A,' and this lead was maintained by the pullets at 24 weeks. In any comparison of the average body weight of the mixed sexes in each group it is important to bear in mind that whereas Group 'C' contained thirty cockerels, Group 'B' had twenty-three cockerels and Group 'A' had twenty-two cockerels.

Unfortunately, it had not been possible to commence this investigation with pullet chicks only and it was not until the age of sixteen weeks that the first separate weighing of pullets took place. If interest is now centered on the pullets and use is made of Table II it will be seen that a comparison of the body weights per bird between Groups 'C' and 'B' shows that at sixteen, twenty and twenty-four weeks Group 'C' pullets were heavier by 10.28, 9.96 and 10.95 ounces respectively and the weights in favour of Group 'C' over Group 'A' were 10.76, 12.36 and 12.76 ounces. In the former case the differences remained fairly constant after sixteen weeks but in the latter after twenty weeks.

Weight gains were low in Groups 'A' and 'B' during the first eight weeks. Great improvement was made by these groups later, until in the final period the gains were substantially the same as in Group 'C.' Group 'A' continued to grow at a rather slow rate until the last period of four weeks.

The cockerel chicks were removed at sixteen weeks and placed in intensive pens on a table poultry ration (see Table I) for a period of twenty-one days. This left the number of pullets in each group at A—34, B—32 and C—28.

Food consumption in Group 'C' cockerels was the lowest (Table III) and the final weights were best in Group 'C' (Table II), but Group 'A' put on the greatest gains and made most use of the table poultry rations, whereas Group 'B' although they ate the same amount of food made the least use of it. The Group 'C' cockerels killed out well, being plump and reasonably fat, Group 'B' cockerels were lean, and rather dry with no traces of fat, while Group 'A' were reasonable, with some fat. Group 'A' and 'C' were marketable but it is doubtful if Group 'B' cockerels could have been sold at a profit on a normal market.

The pullet chicks were finally weighed and transferred to their laying quarters at the completion of the sixth period

TABLE II

Average Body Weight for Each Period

Period	Age in weeks	Group (A) Mixd.	Group (A) Plts.	Group (A) Ckls.	Group (B) Mixd.	Group (B) Plts.	Group (B) Ckls.	Group (C) Mixd.	Group (C) Plts.	Group (C) Ckls.
		ozs.				ozs.			ozs.	
Day Old		1.53	—	—	1.52	—	—	1.55	—	—
1	4	4.48	—	—	3.86	—	—	6.10	—	—
2	8	12.57	—	—	10.98	—	—	20.83	—	—
3	12	24.70	—	—	23.85	—	—	33.79	—	—
4	16	38.14	35.52	42.18	39.71	36.00	44.87	50.58	46.28	54.40
5	20	—	46.35	62.18	—	48.75	55.65	—	58.71	69.24
6	24	—	58.94	—	—	60.75	—	—	71.70	—

TABLE III

Average Food Consumption of Each Bird

(Cockerels withdrawn after 4th period)

Period	Group (A) Mash	Group (A) Grain	Group (A) Total	Group (B) Mash	Group (B) Grain	Group (B) Total	Group (C) Mash	Group (C) Grain	Group (C) Total
	ozs.			ozs.			ozs.		
1	10.60	3.94	14.54	9.19	5.32	14.51	15.76	4.24	20.00
2	32.10	12.60	44.70	17.55	14.53	32.08	27.93	17.41	45.34
3	53.61	21.68	75.29	36.58	23.93	60.51	42.06	21.79	63.85
4	50.14	33.14	83.28	42.18	34.33	76.51	61.38	35.86	97.24
5	56.35	42.82	99.17	52.62	34.75	87.37	66.09	38.56	104.56
6	58.70	49.17	107.87	65.25	57.50	122.75	75.70	34.66	110.36
TOTALS	261.50	163.35	424.85	223.37	170.36	393.73	288.83	152.52	441.35
TOTALS IN LBS.	16.3	10.2	26.5	14.0	10.6	24.6	18.1	9.5	27.6

when they were 24 weeks old. The Group 'C' pullets were commencing to redden up with one bird actually in production. Groups 'A' and 'B' showed no sign of production and looked as if they would be rather late in starting. On handling, Group 'C' were good, and Groups 'A' and 'B,' although in fair condition, could not be compared satisfactorily with them.

CONCLUSION

It has been demonstrated that under our conditions chicks can be reared satisfactorily on simple home grown rations as used in this experiment. Growth is slow in the early stages but improves fairly rapidly as maturity is reached. Better early growth would probably be obtained if a more palatable vegetable protein was used, and it may be that pea meal, or a combination of bean and pea meal would give better results. Alternatively bean meal used in smaller proportion than was done in this experiment might cause a high food consumption with a consequent increase in rate of body growth. It was obvious during the experiment that growing chicks would not graze unless they were given sufficient palatable foods to keep them contented. The real proof of these rations is in the production of the resulting pullets. The pullets reared in this experiment are being housed in slatted floor laying houses, and it is hoped to issue a further report on them when their laying season has been concluded.

CANADIAN EGG OUTLOOK IMPROVED

Greatly increased domestic consumption of eggs in Canada has improved the egg marketing problem and reduced the possibility of large egg exports to the United States. When the British egg contract, which had for years taken care of Canada's surplus, was not renewed in January, egg prices dropped sharply. A further decline, which might have reached a very undesirable low level, was checked by a government announcement of a support price program. The announced price was low, 38 cents per dozen for eggs in storage at the end of the season, but it served two useful purposes: It offered reasonable protection to producers, and allowed the price to decline sufficiently to stimulate consumption enough to eliminate the threat of an unwieldy surplus. (Foreign Crops and Markets, U.S.D.A.)

SAVING LABOR ON THE POULTRY FARM

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Standards as to the number of birds that can be cared for by one man are constantly being raised. Twenty years ago, in a study that I made while connected with the New Hampshire Agricultural Experiment Station, it took about 6000 hours a year of labor, or the equivalent of 2 men working 56 hours a week, to run a poultry farm carrying an average of only 1000 layers. Even the most efficient farms in the study required 5000 hours or the labor of $1\frac{1}{2}$ men to operate a 1000 bird plant.

Contrast this with the situation today when we consider a reasonable standard for a one man operation as 1600 layers, and a 2 man operation of 3200 birds, including the raising of replacements. Individual poultrymen today will greatly exceed this standard. I know of several farms in Maine where one man handles all of the work including egg grading, but not including brooding, on 4000 to 5000 layers.

We have a similar situation in the case of broiler growing. Back as short a while ago as 1944, according to a study covering 170 broiler growers made by the Maine Experiment Station, one man, working 8 hours a day could care for only 4000 broilers. Our average today is about double this figure or 8000 per man. We consider 12,000 birds per man a reasonable standard, and we have a number of plants where one man takes care of 20,000 birds.

How was this remarkable progress obtained? The explanation is partly a matter of changes in house design, partly a matter of equipment, and partly due to changes in management methods.

But before going into this, let us insert a word of caution. Labor is only one of the costs, and not the most important one, of producing eggs and poultry meat. Saving labor is not a goal in itself—it is important only as it affects cost of production. There are many methods of saving labor that will not lower the cost of production—may in fact actually increase it. Crowding birds, putting 2000 birds in a house made for 1000, will save labor but it will not save in costs. Neglecting birds and needed repairs will save labor but increase costs. In fact were we able to cut our labor costs to zero it would still be possible to lose money on poultry. Let us always

examine a labor saving idea with this question in mind, "Will I get as good results?"

So with this caution, let us examine some of the methods by which we can do our work easier and take care of a larger number of birds.

Large Houses, Large Pens: More than any other factor, this accounts for our improved labor efficiency today. Laying houses should not be smaller than 36′ in depth and one house rather than several smaller ones is recommended. If over 1200 capacity is desired, two or three story construction will result in about a 25% saving in building costs. The question of how many birds can be run in a single pen is a subject of controversy. The writer's personal preference would be for pens of 800 to 1000 bird capacity.

For brooder houses the rule should be a house large enough to handle the number of chickens that are hatched at any one time. From a disease standpoint we are firmly of the opinion that chicks of different ages should never be housed in the same building. If our hatches run 1000 chicks to a hatch we would build brooder houses with 1000 chick capacity. As to size for a brooder house, this will depend upon the above consideration. In general we would recommend at least 24′ in depth. For large capacity, the choice would be a 30′ or 60′ house. Large scale broiler growers should consider 36′ or 48′ wide houses.

Central Heat Brooding Systems: Hot water heating, with pipes either vertical on the rear wall or horizontal over the floor, is a tremendous labor saver. However, the cost of such an installation is high when applied to a small house. For houses of over 4000 bird capacity hot water brooding should receive serious consideration. For smaller houses the choice in most cases will have to be colony brooder stoves.

Watering Systems: Automatic waterers that will operate even in the coldest weather are a "must." Soil heating cable has solved the freezing problem. For layers the writer's preference is a trough type waterer, with a float, and drain for overflow and cleaning. For the brooder house satisfactory automatic waterers are available and can be used after the chicks are 10 days or two weeks of age.

Automatic Feeders: This is the newest development in the way of poultry equipment. They are great labor savers and will waste less feed than careless hand-feeding or poorly designed hoppers. However, automatic feeders are expensive —probably prohibitively so for small buildings. For larger

installations of over 4000 broilers their cost is very little more than hand feeders. Thus far, automatic feeders have had their greatest application in large brooder houses. They are practical for layers but represent an investment two or three times as much as hand feeders.

Other Equipment: Carriers are a worthwhile investment in houses over 100′ in length. Elevators in the grain room are a necessity for buildings of three or more stories. With some type of multi-story buildings the storage of grain in the attic and distribution to floors below by means of chutes is a valuable labor saving method. Fans have proved helpful in many cases in solving a ventilation problem. Roost pits have replaced entirely the old fashioned dropping boards.

Labor Saving Methods: One of the biggest changes in management methods has been our treatment of litter. Deep litter for both brooding and for the layers is an accepted practice. We now add litter and stir it rather than clean out the pens at frequent intervals. The writer, however, still feels that a thorough disinfecting and new litter is advisable for each lot of chicks started and for each pen of pullets housed.

Clean out chutes and trap-doors in the floor, and drive in doors in the bottom pens, reduce the annual litter cleaning chore. The use of a small garden tractor with a snow-plow blade is another aid in moving litter.

No roosts is another idea that is receiving a trial. Additional information is needed before this practice can be recommended, however.

The above list of labor saving equipment and management methods could be extended indefinitely. The poultryman must remain alert to new developments that will increase efficiency lest he be left behind in the march of progress. Obsolescence of buildings and equipment is a serious problem that must be faced by many producers.

A *Swiss* physician has reportedly developed a new solution for *preserving eggs*. It can be applied at normal temperatures by a dipping process and is supposed to keep eggs fresh at least a year without refrigerated storage. The protective film which is formed under the shell is odorless, tasteless and harmless to the health.

QUALITY OF MARKET EGGS CAN BE IMPROVED

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A recent study of changes in egg quality for the North Central Region reveals that during the spring months one-third of the eggs delivered by producers were below A grade. About 18 per cent graded B or C. Approximately 11 per cent were stained and dirties, 4 per cent were cracked and .6 per cent were leakers. The cause of one-third of the eggs being below A grade was attributed to dirty eggs, failure to get the eggs into market channels quickly, rough handling and poor production practices. It is estimated that the producer could have received 7 per cent more cash income had he delivered only grade A eggs.

In general, the larger producers delivered a larger percentage of grade A eggs and a smaller percentage of stained and dirty eggs. Brown shelled eggs had the highest percentage of grade A eggs. Such eggs have the advantage due to inability to detect slight stains, and it is believed that it is slightly more difficult to determine accurately the quality by candling.

The cause of 18 per cent of the eggs being B or C grade is due to the eggs being held too long at the farm under improper environmental conditions. The storage facilities may be too warm and too dry. A basement room which is cool and moist can usually be provided. One should collect the eggs at least twice a day. For collection a wire basket should be used in order to facilitate the removal of the heat in the egg. To save time one should provide more than one basket. The next morning after they have cooled out they should be cased. One should not case the eggs with the large end down for when this is done the air cell may become broken down and the grade reduced because of this conditoin. As frequently as is practical and possible they should be taken to market. Ideal conditions are not always easy to provide on the farm. The best time to sell an egg is soon after it is laid. One can get top market price when the eggs still have that fresh laid quality. One should be careful to cull out the cracked eggs and small eggs. These eggs are more valuable for home consumption than they are in market channels. Care should be exercised to avoid rough handling that would increase the incidence of cracked eggs and leakers.

One of the important factors responsible for changes in the quality of market eggs is soiled eggs. The producers are penalized by a lower price; in market channels the loss in quality is greater than for clean eggs and soiled eggs decrease the consumer demand for eggs. Good management factors can reduce this loss. Frequent gathering rather than once a day will help. Darkened nests rather than open nests reduce the loss. Nests that can be closed at night to prevent hens roosting in them will materially reduce the number of soiled eggs produced. One should remember that 99 per cent of all eggs laid are clean before they come in contact with the nest. In a study made at the University of Missouri the use in the nests of shavings, oat hulls, sawdust and excelsior produced a higher percentage of clean eggs than did straw, burlap and ground corn cobs. Birds confined to the poultry house produced fewer dirty eggs than did those allowed to range in fair weather. As a compromise it is recommended that the laying flock be confined until 2 p.m. By this time a great proportion of the eggs will have been laid. It is needless to remind the producer that damp litter in the poultry house increases the incidence of dirty eggs. Built-up litter, which is more apt to remain dry, may partially solve the problem. Certainly one should not allow the flock to range on muddy yards. It is thus seen that there are many details necessary to decrease losses in quality in market eggs. Success can be attained by gathering often, maintaining them in cool moist places, careful handling and hurrying to market. If this is done a material proportion of the 7 per cent loss now experienced will reach the producer's pocket. (Swift & Co.)

For the United States, roughly one-fourth of the eggs produced come from flocks of under 100, one-fourth from flocks of 100 to 200, one-fourth from flocks of 200 to 400 and one-fourth from flocks of over 400 chickens.

Nearly one-half of the farms reporting chickens had less than 50 chickens per farm. Nearly three-fourths of the farms had less than 100 chickens and nearly 90 percent of the farms reported less than 200 chickens per farm. (Facts and Figures about the Poultry Industry. Poultry Branch, Production and Marketing Administration, U.S. Dept. of Agr., Washington, D.C. Oct. 1949.)

SOME VITAMIN NEEDS OF POULTRY SATISFIED BY GRAIN

Poultrymen won't have to worry about shortages of at least two vitamins in their laying and breeding flocks. They are biotin and pteroylglutamic acid. Both are necessary for laying hens and chicks, but both are supplied by any good practical laying ration.

That's one of the discoveries in poultry nutrition experiments by W. W. Cravens, M. L. Sunde, J. R. Couch, C. A. Elvehjem, and J. G. Halpin, working in cooperation with the International Baby Chick Association and the Western Condensing Company.

When they fed hens a diet deficient in pteroylglutamic acid the hatchability dropped to zero in four to six weeks, and egg production fell to a very low level in about eight weeks.

Even if pteroylglutamic acid is not present in their feed, hens may do quite well if the ration contains dextrin as a carbohydrate source. Apparently dextrin favors the "manufacture" of the vitamin in the digestive tracts of mature hens.

A ration for breeding hens should contain about half to one part in a million, by weight, of pteroylglutamic acid according to indications to date.

The results of the pteroylglutamic acid tests are similar to those reported a year ago on biotin, in that it is not likely that either will be deficient in a good practical ration. However the work is being continued to find out for certain whether hens kept for production of hatching eggs get enough pteroylglutamic acid in an ordinary ration.

Further work on biotin has failed to disclose exactly how or why biotin is needed for good hatchability, but has emphasized the need for it and the fact that it will not be a limiting factor for hens on an ordinary grain ration. The workers found that feeding 40% oats in a ration lacking biotin promoted the synthesis of biotin in the hens' intestinal tracts. Oat groats, at the same level, did not give as good results and 10% oat hulls had no effect on promoting biotin synthesis. (From annual report, bulletin 489, Wisconsin Agricultural Experiment Station, Madison, Wisconsin.)

CHINA EGG PRODUCTS SITUATION 1950, PRODUCTION AND TRADE PROSPECTS

The 1950 production of eggs in China is expected to be larger than last year. Present indications of the spring egg collection in North China point to a much larger one than during the same period in 1949. Presently most of the eggs on the market are brought in through the normal collection channel—peddlers and dealers, but an increasing portion is now directly collected by farm co-operatives on behalf of the China Egg Products Company—the state chartered organ.

Exports of egg products during 1949 surpassed all post-war records, but were still much below the pre-war average of 104,950 metric tons (combined in terms of moist eggs). By value, the 1949 exports of egg products were on the top of the list of all exports from China.

While opinions on prospective exports in 1950 are divided, this office believes that the current egg products export will show another increase from the 1949 level. As usual, the bulk of these exports will go to the United Kingdom in the form of moist egg products. The United States, which took very small quantities of dried egg products in post-war years, substantially increased her taking in 1949, especially in dried egg yolk. With the present outlook of egg production, buyers in the United States should have no difficulty in obtaining in 1950 about half of her pre-war takings, which averaged (1934-36) 871 metric tons of dried egg albumen and 1,927 metric tons of dried egg yolk. (Foreign Agriculture Circular, June, 1950.)

W. D. Termohlen, Director of the Poultry Branch, Production and Marketing Administration, U. S. Dept. of Agriculture reports a gradual leveling out of the seasonal egg production curve in the United States. There has been a great increase in the monthly rate of lay for the fall and winter months. There has been little change in the spring. This will probably mean that less shell eggs will be needed for storage purposes and that the price spreads between the spring and fall months can be expected to become narrower.

REVIEW OF POULTRY PUCLICATIONS

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GENETICS

HAYS, F. A. *(Massachusetts Agric. Expt. Sta., Amherst.)* HIGH FECUNDITY IN POULTRY. *Poultry Sci. 28:* 921-928. 1949.—This study was made on R. I. Red females bred for high fecundity. The first section is concerned with the decline in egg production from 1st to 2nd laying yr. These data suggest that a low rate of decline is desirable from the breeding standpoint. The 2d section has to do with the following factors that may affect egg production: maximum number of eggs laid during any one month, the time when this max. was attained, and the avg. rate of decline following the month of max. production. The first and the last of these factors are intimately associated with annual production. The 3d section is concerned with the possible effects of house temp. and length of day on egg production. There is evidence that declining house temps. adversely affect egg production. Length of day, however, does not appear to exert an important influence on egg production.—*F. A. Hays.* (Biological Abstracts)

HAYS, F. A. *(U. Massachusetts, Amherst.)* MORTALITY RATE IN RELATION TO EGG PRODUCTION. *Poultry Sci. 28:* 707-712. 1949.—The relation of mortality rate over a 10-yr. period to 1st-yr. egg production was examined in 297 families of R. I. Reds. 7059 chicks were hatched, 3246 pullets were included for the age period from 8 weeks to 6 mos. and 2863 pullets were placed in the laying houses. High mortality in both sexes to the age of 8 weeks was associated with superior production of surviving sisters in their 1st laying yr. High mortality in families of pullets between the ages of 8 weeks and six months was associated with superior 1st yr. records of their sisters that survived. Mortality rate by families in the laying house during the 1st yr. had no relation to production of survivors.—*F. A. Hays.* (Biological Abstracts)

HAYS, F. A. *(Massachusetts Agric. Expt. Sta., Amherst.)* TEMPERATURE AND VIABILITY AS RELATED TO WINTER PAUSE INCIDENCE AND DURATION. *Poultry Sci. 28:* 894-897. 1949.—Data covering a 10-yr. period consisting of 301 families of R. I. Reds which included 7059 chicks hatched, 3246 pullets between the ages of 8 weeks and 6 months and 2863 pullets housed appear to support the following deduction regarding the incidence and duration of winter pause: Low temps. of winter seem to stimulate a higher incidence of pause, but do not consistently increase the duration of pause; mortality rate (viability) in families of chicks up to the age of 8 weeks shows no important relation to subsequent winter pause incidence or duration; mortality rate in families of females between the ages of 8 weeks and 6 mos. is no criterion of either incidence or duration of pause in surviving sisters; mortality rate in families of pullets durng the 1st yr. in the laying house may run as high as 50% with no adverse effect on the incidence or duration of pause; when mortality exceeds 50% there is fragmentary evidence that incidence and duration of pause increase.—*F. A. Hays.* (Biological Abstracts)

HOLLANDER, W. F. *(Larson Coll., New Haven, Conn.)* BIPATERNITY IN PIGEONS. *Jour. Heredity 40:* 271-277. Illus. 1949.—Seven pigeons *(Columbia livia)* showing sectorial mosaicism involving sex-linked color genes are descr., with pedigree and progeny-test data. Five of the specimens are females and should have only 1 sex chromosome. Somatic segregation in these cases seems impossible. Two of the females show simultaneous mosaicism for an autosomal gene, which in 1 case is not represented in the bird's genotype. Somatic mutation also seems a very improbable explanation of the mosaicism. Double fertilization of a binucleate egg seems possible in at least 1 case, but autonomous formation of tissue by supernumerary sperms appears to be the most plausible suggestion. The term bipaternity is employed for such an origin of mosaicism, and an exptl. test is ssuggested using artificial insemination.—*W. F. Hollander.* (Biological Abstracts)

HUTT, F. B. *(Cornell U., Ithaca.)* SEMI-LETHAL ACTION OF THE GENE FOR EXTENSION OF BLACK PIGMENT IN THE FOWL. *Genetics 35:* 115-116. 1950.—*An abstract.* (Biological Abstracts)

LERNER, I. MICHAEL, DOROTHY CRUDEN, and LEWIS W. TAYLOR. *(U. California, Berkeley.)* THE RELATIVE BREEDING WORTH OF FULL SISTERS. *Poultry Sci. 28:* 903-913. 1949.—The theoretical basis of assessing the relative worth of individual records and of family avgs. was subjected to an exptl. test. Close agreement between observation and expectation on the basis of the genetic theory was obtained for the annual avg. egg production of birds surviving the 1st laying yr. as well as of all birds housed at 5 mos. of age. Reasonably close agreement was also obtained for the production of surviving birds from the beginning of the laying period to Dec. 31 of their 1st laying yr., and for sexual maturity. The other traits investigated (production of all birds to Dec. 31, and the avg. wt. of the first 10 eggs laid) could not be subjected to a direct comparison between observation and expectation, but apparently fall into the same pattern of behavior. The significant conclusions to be derived from this analysis refer to the validation of the formulas (derived by Lush on the basis of Wright's deductive analysis of genetic relationships) to be used in the assessment of the breeding value of individuals from their own records and from the avg. performance of the family of sisters to which they belong. The relative amt. of attention to be paid to these 2 criteria in the course of selection is a function of the degree of heritability and of family size. Tables are presented from which the weighting of family avgs. for the common range of heritabilities and family sizes in poultry breeding may be obtained.—*Authors.* (Biological Abstracts)

WARREN, D. C. *(Kansas State Coll., Manhattan.)* AN INHERITED FEATHER DEFECT IN THE FOWL. *Jour. Heredity 40:* 267. Illus. 1949.—This new factor results in a roughness of the feathers considered to justify the name "ropy." The down of the chicks fails to develop the characteristic fluffiness and the chicks are referred to as "sticky." The absence of a fissure in the proximal half of the shaft of the feather is the most reliable identification of the trait in the adult. It behaves in breeding tests as an autosomal recessive. Tests showed no linkage with multiple spurs, rumplessness, naked-neck, feathered leg, rose comb, polydactyly, crest, duplex comb, frizzling, and muff. The day-old "sticky" chicks are almost indistinguishable from another trait called "stringy" but the adult stringy are much more defective than the ropy adults. The feathers of the stringy are too defective to permit identification of ropy in the presence of stringy.—*L. M. Dickerson.* (Biological Abstracts)

BREAST BLISTERS IN COCKERELS. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946,* page 83.

In this study the progeny birds under observation were raised in brooder houses until 12 weeks old. They were not exposed to any visible projections where they roosted to cause breast blisters by physical means.

Moreover, in the range shelters, later, the roosts were of 2" x 4" lumber with the flat side up. There appears to be some indication that breast blisters or the susceptibility to this defect may be hereditary. (Experiment Station Record)

BREEDING COCCIDIOSIS-RESISTANT CHICKENS. *What's New in Farm Science, Annual Report, Part One, Wisconsin Bulletin 487*, June 1949, page 47.

Resistance to coccidiosis is inherited by chickens and that the male and female are about equal in their ability to transmit resistance to their offspring. (Experiment Station Record)

GENETIC STUDIES OF CERTAIN APPARENT MUTANT CONDITIONS IN THE FOWL. THE INHERITANCE OF AN ABNORMAL FEATHER CONDITION (STRINGY) IN WHITE LEGHORN CHICKENS. *Sixty-Second Annual Report of the Director, Purdue University, Indiana, for the year ending June 30, 1949*, page 22. (Experiment Station Record)

PHYSIOLOGY

BOAS, NORMAN F. *(Mt. Sinai Hosp., N.Y.C.)* ISOLATION OF HYALURONIC ACID FROM THE COCK'S COMB. *Jour. Biol. Chem. 181:* 573-575. 1949.—Aqueous extraction methods were used according to descriptions by Meyer, and Meyer and Palmer. Starting with 500 g. of adult cocks' combs a yield of 500 mg. of relatively pure hyaluronic acid was obtained. Its identity was based upon its viscosity, reaction with hyaluronidase, glucosamine, nitrogen and acetyl contents and on its electrophoretic pattern.—*N. F. Boas.* (Biological Abstracts)

CHAPMAN, D. G., A. A. HANSON, R. H. COMMON, and W. A. MAW. THE EFFECT OF GONADAL HORMONES ON LIVER NUCLEIC ACIDS IN THE IMMATURE PULLET. *Canadian Jour. Res. Sect. D, Zool. Sci. 27:* 200-206. 1949.—The ribonucleic acid, desoxyribonucleic acid, and the ratio of ribonucleic acid to desoxyribonucleic acid in the liver of immature pullets treated with 4.5 mg. of testosterone propionate over a 12-day period were all increased when this treatment was supplemened by treatment with estrogen. The possible significance of these effects in relation to other effects of similar gonadal hormone treatments is discussed.—*Auth. abst.* (Biological Abstracts)

CSONKA, FRANK A., and MARLOW W. OLSEN. *(U.S. Dept. Agric., Washington, D. C.)* FUNCTION OF EGG WHITE IN EMBRYONIC DEVELOPMENT. *Proc. Soc. Exptl. Biol. and Med. 72:* 479. 1949.—Egg white from a fertile hen's egg was removed and replaced with the egg white from another fertile egg. To combat infection antibiotics were used. After 3 weeks of incubation of 12 such eggs prepd., 3 chicks hatched which were normal in every respect. This expt. demonstrates that the chief function of the white of the hen egg is to furnish food for the developing embryo. These are probably the first live chicks produced after such drastic treatment. The 2 chalazae in these expts. were also removed with the egg white and thus the position of the developing embryo depended on gravity.—*F. A. Csonka.* (Biological Abstracts)

DOYLE, W. L., and R. L. WATTERSON. *(U. Chicago.)* THE ACCUMULATION OF GLYCOGEN IN THE "GLYCOGEN BODY" OF THE NERVE CORD OF THE DEVELOPING CHICK. *Jour. Morph. 85:* 391-403. 1949.—The presence of glycogen in the glycogen body of the chick spinal cord, heretofore demonstrated only histochemically, was verified by microchemical analysis. Segments 26-29 of the chick nerve cord contain approx. 0.012 mg. of glycogen on the 10th day of incubation. This increases rapidly ($K = 0.83$) up to 0.373 mg. on the 14th day, and

at a slower but still high rate (K = 0.27-0.31) up to a value of about 3 mg. at hatching. Most of this glycogen is present in the glycogen body. In some specimens the glycogen content of the glycogen body constitutes as much as 75% or more of its lipid-free dry wt. The glycogen in the glycogen body represents 15-28% of the liver glycogen. Taking liver glycogen as 40% of the total glycogen of the chick (Wladimirov, '30), that present in the glycogen body represents approx. 5-10% of the total body glycogen from 15 days of incubation to hatching. Unlike liver glycogen, the glycogen of the glycogen body is not markedly depleted at hatching or following starvation for 24 hrs. post-hatching. This does not verify histochemical observations (Watterson, '47).—*Auth.* (courtesy Wistar Bibl. Serv.).

GLAZENER, E. W., C. S. SHAFFNER, and M. A. JULL. *(U. Maryland, College Park).* THYROID ACTIVITY AS RELATED TO STRAIN DIFFERENCES IN GROWING CHICKENS. *Poultry Sci. 28:* 834-849. 1949.—Cockerels from a rapid-growing and a slow-growing strain of both New Hampshire and Barred Plymouth Rock chickens were fed thyroprotein at the levels of 5, 10, 15 and 20 g. per 100 lbs. of feed. The females of the same strains were used to determine the relative daily thyroxin secretion rates. Thyroprotein depressed the growth rate of the rapid-growing strain of New Hampshires and accelerated the growth of the slow-growing New Hampshires and the strains of Barred Rocks, both of which grew less rapidly than the rapid-growing New Hampshires. Five g. of thyroprotein per 100 lbs. of feed proved to be opt. for growth and feed utilization for the ration used. Thyroprotein feeding stimulated feathering in all strains except the rapid-growing New Hampshires which were very rapid-feathering naturally. The females of the rapid-growing strains had a higher level of thyroxin secretion during the growing period than did those of the slow-growing strain. The results indicated that strains differing in rates of growth also differ in thyroidal activity.—*C. S. Shaffner.* (Biological Abstracts)

GODFREY, GEORGE F. *(Oklahoma A. and M. Coll., Stillwater.)* THE EFFECT OF FEEDING THYROPROTEIN ON EGG SHELL QUALITY AND HATCHABILITY. *Poultry Sci. 28:* 867-873. 1949.—Thyroprotein ("Protamone" containing 2% butyl-soluble iodine) fed to 83 Oklahoma Station Strain New Hampshire pullets at the rate of 10 g. per 100 lbs. of feed consumed in an all-mash diet, had no effect on egg production, body wt., feed consumption or hatchability when compared with a control group of 89 pullets of the same strain. A slight improvement in egg-shell quality as measured by 14-day incubation wt.-loss, specific gravity, and egg-shell thickness was apparent in the treated birds during the course of the expt., May 3 to Aug. 28, 1948. Evidence is presented indicative of a differential response to thyroprotein by the different birds within the strain. At least part of the genetic control of egg-shell quality is exerted through the thyroid gland.—*G. F. Godfrey.* (Biological Abstracts)

GODFREY, GEORGE F. *(Oklahoma A. and M. Coll., Stillwater),* and R. GEORGE JAAP. *(Ohio State U., Columbus.)* THE RELATIONSHIP OF SPECIFIC GRAVITY, 14-DAY INCUBATION WEIGHT-LOSS AND EGG SHELL COLOR TO HATCHABILITY AND EGG SHELL QUALITY. *Poultry Sci. 28:* 874-889. 1949.—Data collected from 3657 randomly selected eggs of the Ohio Strain of New Hampshires for a 35-week period and from 3050 eggs of the Oklahoma Strain of New Hampshires for a 15-week period show that egg shell color, specific gravity and 14-day incubation wt. loss are associated with hatchability and egg shell quality. Eggs with dark brown shells, eggs with a high specific gravity and eggs with a low 14-day incubation wt. loss hatched better than eggs at the opposite ends of their respective scales because they lose less moisture and have less variability of moisture loss during incubation. Such eggs also had better shell quality as measured by shell thickness and shell breaking strength. Using correlation methods of analysis and comparisons of eggs above and below selected "critical" points, it was found that specific gravity was about 3 times as effective in select-

ing for egg shell quality as either 14-day incubation wt. loss or egg shell color. Any improvement to be expected in hatchability as a result of using any of these methods of selection is slight. Breeders may classify birds for specific gravity, 14-day incubation wt. loss and egg shell color on the basis of 12 eggs laid in March.—*G. F. Godfrey.* (Biological Abstracts)

GOFF, O. E., and J. T. TUMLIN. *(Tennessee)* FERTILITY AND HATCHABILITY IN BARRED PLYMOUTH ROCKS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950,* page 151. (Experiment Station Record)

GOFF, RICHARD A. *(U. California, Berkeley.)* DEVELOPMENT OF THE MESODERMAL CONSTITUENTS OF FEATHER GERMS OF CHICK EMBRYOS. *Jour. Morph. 85:* 443-481. Illus. 1949.—The behavior of the pulp and vascularity of down feather germs is described from their first appearance in the embryo until that characteristic of the adult regenerating feathers is established. The development of the vascular system follows a definite pattern which can be correlated with the developing epidermal part of the germ. In the region where the barb-vane ridges are forming there is always a uniform capillary network. After the early differentiation of the barb-vane ridges, there occurs a transition to a system of longtitudinal vessels which correspond approximately in number to the barb-vane ridges. The transition from the down feather germ to the juvenile feather germ is evidenced by the appearance basally of a new capillary network which differs from that of the down feather germ. Regression of the vascular system of the down feather begins in the apical end with the keratinization and shrinking of the pulp membrane. The pulp cells and blood cells are compressed into a slender strand within the pulp membrane. In the base of the down feather germ, thin, horny membranes are formed from the pulp membrane overlying the apical end of the pulp. These horny caps are comparable to the pulp caps of the regenerating adult feather. The pulp cells and blood cells distal to the first horny cap are not resorbed as in the adult feather germ, but remain within the surrounding keratinized membranes which break off at the calamus after hatching.—*Auth.* (courtesy Wistar Bibl. Serv.).

GOWE, R. S. *(Cornell U., Ithaca, N. Y.)* RESIDUAL ESTROGENS IN THE TISSUES OF FOWL TREATED WITH DIENESTROL DIACETATE. *Poultry Sci. 28:* 666-669. 1949.—Biological assays were made to determine the quantity of residual estrogen remaining in the flesh and skin, liver, gizzards, hearts, and abdominal adipose tissues of 11 cockerels which had been fed dienestrol diacetate over a 13-week period. In 100 g. of muscle and skin tissue from each of 7 birds there was less than 14.5μg. of dienestrol per 100 g. The same tissue of 3 others contained more than 12.2μg. of dienestrol per 100 g., while in the flesh and skin of one cockerel there was approx. 14.5 μg. of dienestrol per 100 g. of tissue. All the other tissues assayed contained negligible amts. of estrogen.—*R. S. Gowe.* (Biological Abstracts)

HENDERSON, E. W. BREED AND EGG WEIGHT VARIATION IN INCUBATION PERIOD. *Quarterly Bulletin, Michigan State College, May, 1950, 32:* 520.—A highly significant correlation coefficient was determined between weight of eggs and the length of the incubation period. Breed differences in incubation period were suggested but within breed correlations were not uniformly significant from the numbers available. (Experiment Station Record)

HUGHES, A. F. W. THE EFFECT OF IODOACETAMIDE UPON CELL DIVISION IN TISSUE CULTURES OF THE CHICK EMBRYO. *Journal of the Royal Microscopical Society, December, 1949. Series III.* Vol. LXIX. *No. 11360 in World List Scientific Periodicals.* Page 215.—

1. A technique is described for the direct study of a chemical agent

upon dividing cells in tissue cultures. The method is combined with phase-contrast cinemicrography.

2. The action of the sulphydryl reactant iodoacetamide has been studied by this means.

3. There are two effects on chick cells in mitosis: an inhibition of the mitotic spindle and of the reconstruction of the nuclei in telophase.

4. The metaphase effect is similar to but not identical with that of colchicine. This substance has no effect on telophase at the concentrations used. (Experiment Station Record)

JUHN, MARY. *(U. Maryland, College Park.)* FEATHER GROWTH IN SEBRIGHT BANTAMS OF HENNY, INTERMEDIATE AND COCKY PLUMAGE. *Jour. Exptl. Zool. 112:* 109-124. Illus. 1949.—Sebright Bantam cocks are hen-feathered in the standard individual but males of cocky and of usually transitory intermediate plumage also occur. To determine plumage pattern and plumage growth relations, the axial increments of regenerating feathers of identical positions were recorded in the breast and saddle of one each of such birds. These records were compared with the earlier described feather growth pattern of the male and the female Brown Leghorn cock and hen, a breed where sexual plumage dimorphism is normal. The cock-feathered Sebright entirely resembled the Leghorn male and differed from the other two Sebright cocks where feather growth proceeded essentially as in the Leghorn female. Parallels in the determination of female plumage by the admn. of estrogens and through the introduction of the appropriate gene (or genes) are discussed.—*Auth.* (courtesy Wistar Bibl. Serv.).

KUMARAN, J. D. S., and C. W. TURNER. *(U. Missouri, Columbia.)* ENDOCRINE ACTIVITY OF THE TESTIS OF THE WHITE PLYMOUTH ROCK. *Poultry Sci. 28:* 636-640. Illus. 1949.—The testes of White Plymouth Rock cockerels varying in age from the 12th day fetal stage until 16 weeks of age were examined with polarized light. The presence of the precursors of the male hormones and the male hormone itself is indicated by the birefringence of these compounds. The birefringent material was observed in the interstitial tissue rather than in the tubules indicating that the site of male hormone secretion in the testes is in the interstitial zone. The brilliance of the birefringence increased with advancing age. This may indicate more intense secretion. In the older birds, there appeared here and there pockets of intense light in the interstitial tissue. It was suggested that these places may function as storage places for the male hormone following its synthesis in the individual Leydig cells.—*Authors.* (Biological Abstracts)

KUMARAN, J. D. S., and C. W. TURNER. *(U. Missouri, Columbia.)* THE ENDOCRINOLOGY OF SPERMATOGENESIS IN BIRDS. III. EFFECT OF HYPO- AND HYPERTHYROIDISM. *Poultry Sci. 28:* 653-665. 1949.—A study is reported of the effect of hypothyroidism, induced by feeding graded amts. of thiouracil, and of mild hyperthyroidism, induced by feeding thyroprotein, on spermatogenesis in White Plymouth Rock cockerels and on the endocrine activity of the interstitial tissue. Thiouracil was fed at the levels of 0.1, 0.3, and 0.6% of a complete starter ration from 1 day to 16 weeks of age. Groups of birds were examined starting at 6 weeks of age and at 2-week intervals. Body, testes, comb, thyroid and pituitary wts. were recorded. Feeding thiouracil at the 0.1% level depressed testis wt. slightly up to 8 weeks of age. Then there was a marked reversal so that by the 14th week, testis wts. of the exptl. birds exceeded the normals by about 10 times. Histological examination indicated a slight precocious development of spermatogenesis during the period from 10 to 14 weeks of age. However, some of the spermatids showed defective attachment with the Sertoli cells and a few spermatids were sloughing off in clumps. In contrast, the cells of Leydig showed delayed development from the 10th week on, and the presence of increased intercellular fluid was observed. Depression of the endocrine activity of these cells was indicated by the retardation of comb growth. Feeding thiouracil at the higher levels reduced body growth more dras-

tically. The marked increase in testis wt. was not observed, but on a body wt. basis the expti. birds exceeded the normals. Spermatogenesis was in progress but there was considerable disorganization of the process with spermatids frequently sloughing off into the lumen of the tubules which appeared to contain an abnormal amt. of fluid. The Leydig cells were abnormal in appearance and non-functional as indicated by the lack of comb growth and birefringent crystals in the interstitial tissue zone. When 12-week-old cockerels were fed 0.3% thiouracil in the feed for a period of 4 weeks, the testes and comb wts. were reduced, but spermatogenesis was not delayed. Feeding 0.04% thyroprotein with the above amt. of thiouracil stimulated above avg. growth of the testes and combs and precocious spermatogenesis. When 20 mg. testosterone per kg. of feed was added to the thiouracil ration, the testis wt. was about normal, but histological examination showed retardation in spermatogenesis. These observations indicate that the hypothyroidism induced by the feeding of graded amts. of thiouracil up to 0.6% is without effect upon the secretion of FSH but progressively depresses the secretion of ICSH. Hyperthyroidism was induced by the feeding of thyroprotein at levels of 0.04 and 0.08% of the ration from 1-day-old until 14 weeks of age. At the 0.04% level there was slightly faster growth in the 8- and 10-week-old groups but the 12- and 14-week-old groups were about the same as the controls. While spermatogenesis proceeded at approx. a normal rate, the avg. comb wt. of each group throughout the expt. was markedly increased over their control group, indicating that the rate of secretion of male hormone was increased. At the 0.08% thyroprotein level slight stimulation of spermatogenesis was observed, associated with marked stimulation of comb growth. It would appear that mild hyperthyroidism in cockerels has only a slight stimulating effect on the secretion of FSH but has a more pronounced effect on the secretion of ICSH. The favorable influence of the thyroid hormone appears to be due chiefly to the stimulation of increased secretion of male hormone which acts upon the final stage of spermatogenesis.—*Authors.* (Biological Abstracts)

KUMARAN, J. D. S., and C. W. TURNER. *(U. Missouri, Columbia.)* THE ENDOCRINOLOGY OF SPERMATOGENESIS IN BIRDS. II. EFFECT OF ANDROGENS. *Poultry Sci. 28:* 739-746. 1949.—A study is reported concerning the influence of the male hormone, testosterone, on the component parts of the testes of White Plymouth Rock cockerels. Admn. of 10 mg./kg. feed or more, depresses the secretion of FSH causing the secondary and primary spermatocytes to involute, leaving only spermatogonia. Admn. of lower levels to cockerels 8 weeks old or less was ineffective, but, when the secondary spermatocytes have developed in the 10-week-old birds, a marked increase in testis wt. resulted due to an increase in spermatid formation. Evidently FSH is essential for growth of the primary spermatocytes and for the meiotic division involved in the production of secondary spermatocytes. When this stage is reached, the hormone normally secreted by the interstitial cells of Leydig plays a role in the transformation of the secondary spermatocytes into spermatids.—*Authors.* (Biological Abstracts)

McCARTNEY, MORLEY G., and C. S. SHAFFNER. *(U. Maryland, College Park.)* THE METABOLIC RATE AND THYROID SIZE OF CHICKS FROM DAMS WITH ALTERED METABOLISM. *Endocrinology 45:* 396-402. 1949.—Three groups of 20 New Hampshire females were each maintained on a control ration, a ration containing 0.022% thyroprotein, and a ration containing 0.1% thiouracil, respectively. After 12 weeks the resting metabolism of the thyroprotein-fed and the thiouracil-fed females was 12% more and 24% less, respectively, than that of the control females. Day-old chicks produced by each of the 2 groups of treated females required about 16% less oxygen than the control chicks. The results of the metabolism studies indicate that chicks produced by both hyperthyroid and hypothyroid females are themselves hypothyroid. About 6μg. of exogenous thyroxin were necessary to affect thyroids of normal size in chicks hatched from eggs laid by thyroprotein-fed females. Aqueous solns. of thyroprotein of KI injd. into control eggs had no effect on chick thyroid size.—*Authors.* (Biological Abstracts)

NORTON, STATA, and HAROLD R. WOLFE. *(U. Wisconsin, Madison.)* THE GROWTH OF THE SPLEEN IN THE CHICKEN. *Anat. Rec. 105:* 83-93. Illus. 1949.—The growth of the spleen was studied in 465 male and 558 female Barred Rock-White Leghorn chickens, ranging in age from 1 day to 1 year, with concn. on ages up to 16 weeks. The period of the most rapid growth of the spleen is from the 1st to the 10th week of age. At 1 week the spleen represents 0.032%, at 10 weeks about 0.21%, of the total body wt. This is the max. relative wt. which the spleen attains. The standard error and coeff. of variation for the body and spleen wts. are given. No significant difference in the body wts. or spleen wts. of males and females is found up to the 13th week. When the spleen wts. are corrected for the slightly greater body wt. of the males, the female chickens are found to have significantly heavier spleens. The growth curve of the spleen is compared with that of the testes. The greatest increase in spleen size takes place earlier in the young chick than the attainment of sexual maturity. A possible correlation between the rapid growth of the spleen in the young chicken and antibody production is suggested.—*Auth.* (courtesy Wistar Bibl. Serv.).

OAKBERG, EUGENE F., and ALFRED M. LUCAS. *(U.S. Dept. Agric., East Lansing, Mich.)* EFFECT OF AGE, SEX AND INDIVIDUAL VARIABILITY ON LYMPHOID TISSUE OF THE PANCREAS IN WHITE LEGHORN CHICKENS. *Poultry Sci. 28:* 675-685. Illus. 1949.—In a study of lymphoid tissue of the body of the pancreas of 45 male and 45 female White Leghorn chickens ranging from 1 to 300 days old, number of lymphoid areas, size of individual lymphoid foci, and total lymphoid tissue did not vary significantly between six different regions of the pancreas. No sex differences were observed. Number of lymphoid areas and total lymphoid tissue increased with age, and this increase was found to be proportional to growth of the entire pancreas. Within this general growth pattern, constitution of the individual was shown to be an important factor with significant differences between birds of the same age and sex in number of lymphoid areas and in total lymphoid tissue. Age differences in size of individual lymphoid areas were considered to result primarily from sampling errors; indivduals within age groups did not differ significantly in respect to mean area of individual lymphoid foci. Large and small lymphoid areas, formation of new areas, invasion of acinar tissue, and cell type were common to birds of all ages. The data are discussed in relation to normality and abnormality of lymphoid areas in the pancreas, and differences from mammalian lymph nodes emphasized. Increase in lymphoid tissues with age and the highly significant variation between birds of the same age and sex appear to be the most important variables to consider in studies of this nature.—*E. F. Oakberg.* (Biological Abstracts)

OLSEN, MARLOW W. *(U. S. Dept. Agric., Beltsville, Md.)* EFFECT OF SHIPMENT ON PRE-INCUBATED FERTILE EGGS. *Poultry Sci. 28:* 731-738. 1949.—Eggs were incubated for 18 hrs., then candled to detect fertility, and cooled for 2 hrs. at 55°F. Following this treatment, 3 groups of pre-incubated eggs together with control eggs, were packed in pre-cooled standard egg cases and shipped by express to different points, whence they were returned to Beltsville and incubated. The pre-incubated fertile eggs in transit from 50 to 96 hrs. gave hatchabilities of 78.4, 78.3 and 80.5, respectively. Unincubated fertile eggs shipped in the same cases gave hatchabilities of 70.3, 79.7 and 76.3%, respectively. To test further the resistance of 18-hr. embryos to adverse conditions, groups of pre-incubated fertile eggs were stored for 72 hrs. at 55°F. Unincubated eggs served as controls and were stored at 55° for 3.75 days. The exptl. and control eggs were then incubated. The pre-incubated eggs gave an avg. hatchability of 82.7% as compared with 81.6% for the controls. Evidently it is entirely feasible to ship pre-incubated fertile eggs without a reduction in hatchability. In another phase of these studies, eggs, after 18 hrs. of incubation, were candled and separated into 3 classes based upon the appearance of the embryo. Embryos showing advanced development comprised one class; those of

intermediate development the 2d class; and those showing least development were placed in the 3d class. These 3 groups of eggs were then replaced in the incubator and allowed to hatch. Those embryos judged to be the most advanced at 18 hrs. gave an avg. hatch of 86.4% of fertile eggs; the intermediate ones, 65.2%; and the embryos showing the least development, 46.8%. In each of the 8 separate hatches, those embryos most advanced at 18 hrs. always hatched best; those of intermediate development gave the 2d highest hatch.—*M. W. Olsen.* (Biological Abstracts)

SPERBER, IVAR. *(Roy. Agric. Coll., Uppsala.)* [THE EXCRETION OF PIPERIDINE, GUANIDINE, METHYLGUANIDINE AND N-METHYLNICOTINAMIDE IN THE CHICKEN.] Kungl. Lantbrukshögskolans *Annaler 16:* 49-64. 1949.—Methylnicotinamide, methylguanidine, guanidine and probably piperidine are excreted by the renal tubules in the chicken. Methylnicotinamide injd. intraven. in large amts. depresses the excretion of piperidine. The pH of the urine appears to have no influence on the tubular excretion of the organic bases examined.—*A. L. Blake.* (Biological Abstracts)

SZIRMAI, JOHN A. *(U. Amsterdam.)* THE EFFECT OF TESTOSTERONE PROPIONATE ON THE CONNECTIVE TISSUE OF THE HEAD APPENDICES AND THE SKIN OF THE CAPON. *Anat. Rec. 105:* 337-359. Illus. 1949.—White Leghorn capons were treated with testosterone propionate (1 mg. daily) for 10 days. Samples from comb, wattle and various skin areas were taken each 4 days over a period of 4 weeks. Similar specimens were taken from normal cocks and untreated capons. Investigation was made with histological and histochemical methods, X-ray spectroscopy, polarizing microscopy and by a gravimetrical swelling method. The fiber substance of the connective tissue of both the capon's and cock's comb was found to have all the characteristics of collagen, except the swelling capacity of low pH. During the hormone treatment the dense fibers of capon's comb became separated into elementary fibrils, while between them appeared a great amt. of metachromatic ground substance. The reversible volume increase of the capon's comb after hormone treatment has been ascribed to the imbibition and release of this substance, accompanied by vasodilatation and vasoconstriction of the circulatory system of the comb. Simultaneously alkaline phosphatase was present in the vessel walls. The body skin of the capon showed swelling properties of young skin, while that of the normal cock reacted as mature, old skin. A relation between the "steroid-sensitivity" of the area of head appendices and its characteristic tissue properties is suggested.—*Auth.* (courtesy Wistar Bibl. Serv.).

TURNER, C. W., and J. D. S. KUMARAN. *(U. Missouri, Columbia.)* GONADOTROPHIC HORMONE STIMULATING PROPERTIES OF PYRIMIDINE SULPHONAMIDE DERIVATIVES. *Poultry Sci. 28:* 855-861. 1949.—The feeding of sulfamerazine and sulfamethazine at levels of 0.1 and 0.2% of the starter ration stimulated the growth of the combs of White Plymouth Rock cockerels up to 12 weeks of age. Examination of the testes indicated stimulation of the stage of spermatogenesis as well as of the interstitial cells of Leydig. These observations seem to indicate that these compounds directly or indirectly stimulate the anterior pituitary to secrete increased amts of the 2 gonadotrophic hormones, FSH and LH or ICSH. The biological activity of several sulfonamides of related structure is reported.—*Authors.* (Biological Abstracts)

WHEELER, ROBERT S., and EDMUND HOFFMANN. *(U. Georgia, Athens.)* GOITEROGENIC ACTION OF IODIDE AND THE ETIOLOGY OF GOITERS IN CHICKS FROM THYROPROTEIN-FED HENS. *Proc. Soc. Exptl. Biol. and Med. 72:* 250-254. Illus. 1949.—Groups of 12 hens were fed a conventional diet supplemented with varying amts. of iodide (as KI) or synthetic thyroprotein. Iodide was fed at levels from 4 to 64 mg./lb. of diet, and thyroprotein at 200 mg./lb. Feeding KI for 30 days resulted in the production of colloid goiters in the adults in rough proportion by wt. to the amount fed. The offspring of

KI-fed hens showed marked thyroid enlargement at hatching. Histologically the goiters in the chicks exhibited follicles distended with colloid and flattened epithelial cells. Marked colloid storage was found in sections of the thyroid glands of hens fed KI, and in 3 of 14 cases colloid nodules and cystic degeneration were observed. Because thyroprotein contains 2-4% iodide and the goiters found in chicks from thyroprotein-fed and KI-fed hens are histologically indistinguishable, it is suggested that iodide may be the goiterogenic agent in thyroprotein.—*Authors.* (Biological Abstracts)

WHEELER, R. S., and EDMUND HOFFMAN. *(U. Georgia, Athens)* IODIDE-THYROID RELATIONSHIPS IN CHICKENS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950,* page 159. (Experiment Station Record)

WHAT BACTERIA ARE NORMAL IN CHICKENS? *What's New in Farm Science, Annual Report, Part One, Wisconsin Bulletin 487, June 1949,* page 46.—Within 16 hours after chicks get their first feeding, bacteria are well established in their intestinal tracts; in the duodenum, ileum, cecal pouches and colon. Of the kinds of bacteria studied, highest numbers were found in the cecal pouches and lowest in the duodenum for the entire 26 weeks. The numbers of coliform and enterococcis organisms in the duodenum and ileum decreased gradually during the 26 weeks, as did agar plate and lactic counts. (Experiment Station Record)

NUTRITION

ALDER, BYRON. *(Agric. Exptl. Sta., Logan, Utah.)* ALFALFA MEAL IN TURKEY RATIONS. *Farm and Home Sci. 10:* 16-17. Illus. 1949.—Turkey production in Utah increased over 9 times from 1934 to 1945, while the increase for the U.S. for this period was only about 2.1 times. The avg. size of flocks in Utah is about 3000 turkeys which are usually purchased as day-old poults from hatcheries or as started poults at 6-8 weeks old. Since feed costs represent about 60% of the cost of producing turkeys, this is an important factor in determining profits. Suncured alfalfa meal of excellent quality is abundantly produced in this area and is usually available at a price considerably lower than the price of ground grains. Growing mashes fed to turkeys from 8 to 29 weeks old containing 10, 15, 20, 25, 30, 35, 40 and 50% of alfalfa meal were used in a series of studies over a 6-yr. period. In mashes containing the higher levels of alfalfa meal, 5 lbs. of alfalfa meal replaced 5 lbs. of mixed ground grains. The % of all other mash ingredients remained constant in all mashes. Broad Breasted Bronze turkeys on rations up to 40% of afalfa all averaged about the same wt. and showed good fleshing and finish at 29 weeks. There was no significant difference in % mortality in any of the lots. There was very little difference in pounds of feed consumed per lb. of gain. Each lot of turkeys on the 50% alfalfa meal mash were smaller and not so well fleshed and finished as other lots. There is no special advantage in using these high levels of alfalfa meal in the turkey growing mashes unless the price of alfalfa meal is sufficiently lower than the price of ground grains used in the mash to give an actual saving in feed cost.—*Eyron Alder.* (Biological Abstracts)

ALMQUIST, H. J. *(Grange Co., Modesto, Calif.)* AMINO ACID BALANCE AT SUPER-NORMAL DIETARY LEVELS. *Proc. Soc. Exptl. Biol. and Med. 72:* 179-180. 1949.—The Methionine requirement of the chick for max. rate of gain on a 30% protein diet is approx. 0.75% of the diet. This value is in direct proportion of the protein levels to the established and confirmed methionine requirement of 0.5% in a 20% protein diet.—*H. J. Almquist.* (Biological Abstracts)

ATKINSON, R. L. and J. R. COUCH. VITAMIN B_{12} STUDIES WITH GROWING TURKEYS. *(Texas Exp. Station). Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950,* page 158.

The growth of the turkeys at 24 weeks of age was not appreciably influenced by the level of B_{12} added to the diet. The turkey males weighed from 20 to 22 pounds, while the hens weighed approximately 15 pounds at the close of the experiment. From the results of this experiment it is believed that the turkey does not require vitamin B_{12} for normal growth. (Experiment Station Record)

BETHKE, R. M. *(Ohio Exp. Station).* WHAT IS NEW IN NUTRITION. *Flour & Feed, 50:* 10, April, 1950.

Research work suggests that APF is made up of several factors which are required by swine and poultry; and that vitamin B_{12} is one of the major components of APF or the Animal Protein Factor.

Dr. Maclay presented some evidence that there might be some vitamin B_{12} in alfalfa. He showed some data from Cornell indicating that alfalfa contains small amounts of vitamin B_{12}. I received a night letter from the Cornell workers yesterday morning to the effect that further investigation had shown that alfalfa only contained traces of it. Presumably there are other substances in alfalfa, as Dr. Maclay pointed out, that give a response in the test that is used in determining B_{12}. Results indicate that alfalfa contains substances similar to what are present in condensed fish solubles or in other animal or fish byproducts. (Experiment Station Record)

CHRISTIE, D. G. VITAMIN A DEFICIENCY IN POULTRY REDUCES PRODUCTION AND DISEASE RESISTANCE. *Agric. Gaz. N. S. Wales 60:* 362-366, 1949.—The value of a supply of green feed to poultry has long been recognized and in recent yrs. research has shown that its beneficial effect is due mainly to the supply of vitamin A and riboflavin. Vitamin A is essential for the maintenance of general health. It is concerned particularly with the health of the mucous surfaces of the body, e.g., those of eye, nose, mouth and gullet; a deficiency results in a lowered resistance of these membranes. It is also essential for maintenance of a normal level of production of eggs with a high content of vitamin A.—*A. J. Loustalot.* (Biological Abstracts)

CSONKA, FRANK A., and M. W. OLSEN. *(U.S. Dept. Agric., Washington, D. C.)* A GROWTH FACTOR TRANSMITTED BY THE HEN THROUGH THE EGG TO HER PROGENY. *Jour. Nutrition 39:* 485-493, 1949.—Two pens of chickens were used to furnish eggs for incubation; one group was fed a high-protein diet of which 20% was casein and the other group was fed a low-protein diet containing no casein. Eggs were incubated from both pens at the same time and the chicks were reared together to 4 weeks of age on the same growing-mash ration, which contained no casein. The chicks from the hens fed the casein diet grew faster than those from the hens fed the low-protein diet, as was shown by their greater body wt. at 4 weeks of age. This difference in chick growth is related to maternal dietary protein as the chief variable component in the exptl. arrangement, the growth effect being transmitted through the egg to the chick. When the casein was replaced in the hen's ration with an equivalent quantity of soybean meal, the same accelerated growth effect was not observed. Addition of dried cow manure or Wilson's liver fraction "L" to the chick mash inhibited the growth of the chicks from hens fed the high-protein-casein ration. The same supplements, however, slightly accelerated the growth of the chicks descended from parents fed the low-protein ration. The growth of the chicks on the supplemented diet whose parents received a high-protein-soybean ration was not affected.—*Auth.* (courtesy Wistar Bibl. Serv.).

CULTON, T. G. *(Kentucky Exp. Sta.)* HIGH ENERGY FEEDS IN THE SOUTH. *Proceedings Association of Southern Agricultural*

Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950, page 148. (Experiment Station Record)

DIETRICH, L. S., C. A. NICHOL, W. J. MONSON, and C. A. ELVEHJEM. *(U. Wisconsin, Madison.)* OBSERVATIONS ON THE INTERRELATION OF VITAMIN B_{12}, FOLIC ACID, AND VITAMIN C IN THE CHICK. *Jour. Biol. Chem. 181:* 915-920. 1949.—Vit. C and vit. B_{12} stimulate growth in the chick when fed a semipurified ration with or without folic acid. Vit. C and vit. B_{12} stimulate the synthesis of folic acid in vivo. Folic acid stimulates the synthesis of vit. B_{12} in the chick, as measured by liver storage.—*L. S. Dietrich.* (Biological Abstracts)

DRIGGERS, J. C. *(Florida Exp. Sta.)* CITRUS SEED MEAL FOR CHICKS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 1950,* page 143. —Citrus seed meal is a rich source of vegetable protein. The detoxified meal used in these experiments contained approximately 43 percent protein.

Experiments including 20 percent commercially prepared citrus seed meal in the diet of White Leghorns demonstrated that, as now prepared, this by-product of the citrus canning and citrus seed oil industries is unsatisfactory for chick growth. A high mortality resulted during the first three weeks in each of these studies. Enlarged gall bladder and sometimes mottled liver, ascites and congestion of the intestinal tract were the manifestations observed.

The primary deleterious factor was found to be a white crystalline compound soluble in acetone and 95 percent ethyl alcohol but insoluble in water and diethyl ether. Chemical analysis suggests that this compound is limonin, the bitter principle of the seed. In certain experiments there were indications that a second factor soluble in alcohol after separate extraction with ether and acetone was a contributing cause of the unsatisfactory results. (Experiment Station Record)

FREY, PAUL R., and H. S. WILGUS. *(Agric. Expt. Sta., Fort Collins, Colo.)* THE UTILIZATION OF CAROTENE FROM DIFFERENT SOURCES BY LAYING CHICKENS. *Jour. Nutrition 39:* 517-528. 1949.—A study was made to compare the utilization by laying chickens of vitamin A-active substances in the form of β-carotene in cottonseed oil, vitamin A esters from fish liver oil, and the naturally occurring carotenoids in fresh and dehydrated alfalfa. The criteria for carotene utilization were based on liver storage, blood levels, and egg content of vitamin A and carotene. 100 White Leghorn hens were placed on a ration deficient in vitamin A activity for 33 days. They were then divided equally into 5 pens, one of which was continued on the basal ration, the other 4 being fed the above supplements containing vitamin A activity equivalent to 2000 I.U. per lb. of ration. At intervals blood samples were taken for analysis and birds sacrificed for liver tissue detns. Liver reserves and blood levels indicated that β-carotene in cottonseed oil was utilized less efficiently than the carotene in alfalfa. The vitamin A activity in eggs from birds receiving alfalfa was about twice that of eggs from birds receiving β-carotene and about 3 times that in eggs of birds receiving vitamin A from fish liver oil. Vitamin A was superior to the other supplements in building liver reserves, while alfalfa was superior in the transfer of vitamin A and carotene to the egg.—*Auth.* (courtesy Wistar Bibl. Serv.).

GILLIS, M. B., and L. C. NORRIS. *(Cornell U., Ithaca, N. Y.)* EFFECT OF THE ANIMAL PROTEIN FACTOR ON THE REQUIREMENT FOR METHYLATING COMPOUNDS. *Jour. Biol. Chem. 179:* 487-488. 1949.—Six groups of 19 four-week-old chicks were used for tests. The growth during a 3-week test-period (on a basal diet of cornmeal, whole wheat, oats, soy-bean meal, fish-oil, salts, riboflavin, niacin, and pantothenate) was increased from 250 g. to 350 g. by the addition of 0.2% betaine HCl to the diet. The addition of 0.15% liver paste increased the growth to 450 g. irrespective of betaine or choline additions. As this

liver paste has been used for some time as a source of animal protein factor (APF), the results suggest that APF relieves the need for extra methylating agents in the diet.—*Howard Lees.* (Biological Abstracts)

GREENBERG, SAMUEL M., CLARENCE E. CALBERT, J. H. PINCKARD, HARRY J. DEUEL, Jr. and L. ZECHMEISTER. *(U. So. California, Los Angeles.)* STEREOCHEMICAL CONFIGURATION AND PROVITAMIN A ACTIVITY. IX. A COMPARISON OF ALL-TRANS-γ-CAROTENE AND PRO-γ-CAROTENE WITH ALL-TRANS-β-CAROTENE IN THE CHICK. *Arch. Biochem. 24:* 31-39. 1949.—Chicks were successfully used in a growth expt. to determine vit. A potency of provit. A. In the chick, pro-gamma-carotene was found to have a provit. A potency of 51% while all-trans-gamma-carotene (prepared by stereoisomerization of pro-gamma-carotene) had a potency of 42% of that of all-trans-beta-carotene. The results obtained with the chick are in close agreement with those obtained in rat growth studies where the potency of this poly-cis carotenoid was shown to be as great or greater than that of the corresponding poly-trans compound.—*H. J. Deuel, Jr.* (Biological Abstracts)

GROSCHKE, A. C., L. A. THORBURN, R. W. LUECKE, F. THORP, JR., and W. N. McMILLEN. THE OCCURRENCE OF VITAMIN B_{12} ACTIVITY IN PIG MANURE AS MEASURED BY CHICK GROWTH RESPONSE. *(Quarterly Bulletin, Michigan State College, May 1950, 32:* 503.

A short chick growth test, 14 days in length, was employed to measure vitamin B_{12} activity in fresh and incubated pig manure. The incubated pig manure was found to be highly potent whereas fresh pig manure contained no vitamin B_{12} activity. The evidence indicated that bacterial synthesis of vitamin B_{12} activity did not occur in the intestines of the pigs studied, but came as a result of microbial fermentation after defecation. (Experiment Station Record)

HALBROOK, E. R. VITAMIN B_{12} IN POULTRY NUTRITION. NEW PRODUCTION METHODS RAPIDLY REDUCING COST. *(Montana State College). The Feed Bag, Vol. 26, No. 4,* page 43.

The cheapest source of vitamin B_{12} today for poultry feeding comes from microbiological fermentation. Most microorganisms grow without vitamin B_{12} but in the process of growth they produce varying amounts of the vitamin.

Even at the present quoted price of $1.33 per pound in less than ton lots, the cost of the amount of vitamin B_{12} needed to supplement 100 pounds of all-vegetable protein ration is less than 10 cents—at the rate of 1 milligram per 100 lbs. which seems to be the desirable level of supplementation if all animal protein supplements are replaced with soybean oil meal.

The level of vitamin B_{12} supplement required to give maximum response is also increased along with an increase in protein level.

An interrelationship of the amino acid methionine and the vitamin choline to vitamin B_{12} requirement was first reported by Schaefer, Salmon and Strength of the Alabama Polytechnique institute.

Vitamin B_{12} was first reported by Smith of Great Britain to contain cobalt. Briggs of Minnesota has reported that preliminary work at the University of Minnesota indicated that inorganic cobalt was at least partially effective in counteracting vitamin B_{12} deficiency in chicks, perhaps due to intestinal synthesis. (Experiment Station Record)

HALBROOK, EVERETT R. VITAMIN B_{12} IN POULTRY NUTRITION. *(Montana State College). Flour & Feed, 50:* 9, April, 1950.

Vitamin B_{12} was first reported isolated in crystalline form by Merck Research laboratory workers in April, 1948. It is a red crystalline compound of high molecular weight and contains about 4 percent of cobalt in addition to carbon, hydrogen, oxygen and nitrogen. It is now recognized as being the most important component of the better known "animal protein factor," and has also been called "chick growth," "hatchability," and "cow-manure" factors in poultry nutritional work.

An interrelationship of the amino acid methionine and the vitamin choline to vitamin B_{12} requirement was first reported by Schaefer, Salmon and Strength of the Alabama Polytechnique Institute. They observed that adding vitamin B_{12} to the diet of rats reduced the requirement for both methionine and choline and of choline in the case of chicks.

Briggs of Minnesota has reported that preliminary work at the University of Minnesota indicated that inorganic cobalt was at least partially effective in counteracting vitamin B_{12} deficiency in chicks, perhaps due to intestinal synthesis.

The part played by external microorganisms in providing chickens with some of their nutritional requirements is a new field. The discovery of Lamoreux and Schumacher (formerly of Cornell) that hen feces contained more riboflavin than the amount in the feed which was fed and the isolation by Schumacher and Norris of an organism capable of synthesizing riboflavin in hen feces was a beginning towards a study of the part played by microorganisms in poultry nutrition.

Bird and Marvel observed that hens in open-front houses produced eggs of higher hatchability than hens maintained in batteries. They showed that this increased hatchability of hens in floor pens could be due to consumption of the droppings since adding 10 percent of dried feces from hens in batteries to their diet gave increased hatchability. (Experiment Station Record)

HAQUE, M. E., R. J. LILLIE, C. S. SHAFFNER, and G. M. BRIGGS. *(U. Maryland, College Park.)* RESPONSE OF VITAMIN-DEFICIENT CHICKS TO THE SEX HORMONES. *Poultry Sci. 28:* 914-920. 1949.—715 New Hampshire chicks were reared in groups of 8 to 10 chicks per group and were fed the same diet except for a specific vitamin deficiency in the diet of each group. The male chicks were injd. with testosterone propionate and the response in comb wt., growth, and mortality compared with non-injd. and control chicks. The female chicks were injd. with alpha-estradiol propionate and the response in oviduct wt., growth, and mortality compared with non-injd. and control chicks. The stimulation of the comb by testosterone propionate, when compared on a body wt. basis, was not prevented by any of the deficiencies. Chicks deficient in vitamin D, however, did not respond to as great an extent as did the control birds. The male sex hormone decreased testis size and had no effect in alleviating the vitamin deficiency symptoms. The oviducts of chicks deficient in folic acid did not respond maximally to estrogen injn. In chicks deficient in other vitamins, the estrogen injns. resulted in normal or greater than normal response of the oviduct. Injns. of the estrogen appeared to increase mortality in groups fed diets deficient in vitamin A, biotin, or riboflavin.—*Auth. summ.* (Biological Abstracts)

INGRAM, G. R., W. H. RIESEN, W. W. CRAVENS, and C. A. ELVEHJEM. *(U. Wisconsin, Madison.)* EVALUATING SOY-BEAN OIL MEAL PROTEIN FOR CHICK GROWTH BY ENZYMATIC RELEASE OF AMINO ACIDS. *Poultry Sci. 28:* 898-902. 1949.—Nine samples of soybean oil meal were subjected to enzymatic hydrolysis and the release of certain amino acids detd. microbiologically. These values were correlated with chick growth supported by the same samples. The data presented show that there is a close correlation between the growth of chicks fed the soybean oil meal samples and the liberation of certain amino acids by the in virto technique used.—*Authors.* (Biological Abstracts)

KARNOFSKY, DAVID A., PRISCILLA A. PATTERSON, and LOIS P. RIDGWAY. *(Sloan-Kettering Inst. Cancer Res., N. Y. C.)* EFFECT OF FOLIC ACID, "4-AMINO" FOLIC ACIDS AND RELATED SUBSTANCES ON GROWTH OF CHICK EMBRYO. *Proc. Soc. Exptl. Biol. and Med. 71:* 447-452. Illus. 1949.—The 4-amino pteroylglutamic acids profoundly inhibit the growth of the chick embryo, with the production of developmental abnormalities. These compounds are active in the range of 0.0036-0.005 mg. per egg and their actions are not prevented by a large dose of folic acid. The "4-amino" folic acids with aspartic acid, threonine, and alanine substituted for the glutamic acid are considerably less toxic, but produce similar effects. Other compounds allied

to folic acid are relatively non-toxic and have no growth-inhibiting activity. 2,6-diaminopurine at LD_{50} doses is not an active growth inhibitor but produces a pale embryo, presumably deficient in hemoglobin.—*J. T. Myers.* (Biological Abstracts)

KEPHART, JOHN C. CAROTENE IN DEHYDRATED ALFALFA. *(Flour & Feed, 50):* 22, April, 1950.

As yet we have had no success in actually stabilizing the carotene of dehydrated alfalfa—we have only succeeded in reducing the rate of carotene destruction, but this to such an extent as to warrant commercial consideration by our company. Although laboratory experiments have given considerably better protection, in actual practice we can expect little more than a 50-60 percent reduction in carotene losses.

On the addition of 0.3 lb. of the antioxidant dissolved in 3 gallons of soya oil to a ton of dehydrated alfalfa we may expect at least a 50 percent reduction in the rate of carotene oxidation when the product is stored under production conditions and this at a cost of about $3 per ton for the chemical and oil at currently prevailing prices.

Several experiments relative to applying the antioxidant to the alfalfa before dehydration have been conducted and from the data collected it was apparent that significantly greater amounts of carotene were retained than if the antioxidant was added after dehydration. However, to attain these results it was necessary to use excessive amounts of the antioxidant solution and this caused the field spraying system to be economically unsound under application methods thus far developed. Emulsions can not be applied after dehydration as on storage the excess moisture results in browning in the alfalfa.

Ill effects from the ingestion of the antioxidant itself or alfalfa treated with the antioxidant have been encountered. (Experiment Station Record)

KRATZER, F. H., BLANCHE MARSHALL, and D. E. WILLIAMS. POTATOES FOR POULTRY. VALUE OF DRIED POTATOES AS FEED FOR CHICKS AND POULTS INVESTIGATED. *(California Agriculture, Vol. 3, December, 1949, No. 12,* page 10.

The experiments indicate that raw potatoes, when sun-dried or oven-dried, are not a satisfactory feedstuff for growing turkeys or chickens.

Although dried cooked potatoes caused a slight reduction in growth and feed efficiency of poults when fed at 40% of the ration, it is likely that they can be fed at the 20% level which, according to reports from other experiment stations, has proven satisfactory with chickens.

Unless an inexpensive method of cooking and drying potatoes becomes available, it is unlikely that potatoes will ever become a popular feedstuff for poultry. (Experiment Station Record)

KRATZER, F. H. *(U. California, Davis.)* VITAMINS FOR TURKEYS: NUTRITIVE REQUIREMENTS FOR ADEQUATE RATIONS UNDER CONTINUING STUDY. *California Agric. 3(2):* 15-16. 1949.—Turkeys require larger amts. of vitamins than do chickens. Plant sources of vitamin D that may be used for mammals are not effective sources for poultry. Each pound of turkey feed should contain 4000 I. U. of vitamin A, 800 A.O.A.C. units of vitamin D, and 1.6 to 2 mg. of riboflavin. Deficiency symptoms of these and other vitamins are descr.—*G. W. Bohn.* (Biological Abstracts)

MAHON, J. H., and R. H. COMMON. *(McGill U., [Ottawa] P. Q., Canada.)* THE AMINO ACID COMPOSITION OF THE HORSEBEAN (VICIA FABA L.) AS RELATED TO ITS NUTRITIVE VALUE FOR CHICKS. *Sci. Agric. 30:* 43-49. 1950.—Results of microbiological assays of the seed of the horsebean for 18 amino acids are presented. The horsebean is relatively very deficient in methionine and cystine and deficient to a lesser degree in tryptophan, glycine, phenylalanine and threonine when considered as a sole source of protein for the chick. The results secured by others in chick feeding trials using horsebeans as the principal source of protein are discussed in the light of these analytical results.—*Authors.* (Biological Abstracts)

MEHRHOF, N. R. *(Florida Exp. Sta.)* BROILER FEEDING TRIALS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950,* page 145. (Experiment Station Record)

MILLER, D. C. and A. C. GROSCHKE. THE OCCURRENCE OF "ANIMAL PROTEIN FACTOR" IN HORSE MANURE AS MEASURED BY CHICK GROWTH RESPONSE. *The Quarterly Bulletin, Michigan State College, February 1950, 32:* 279.

A short chick assay method, 14 days in length, for measuring APF activity was described. Chicks produced from hens fed a diet containing sources of APF were satisfactory assay animals after they had been depleted during a two week post-hatching period. Incubated horse manure was found to be a potent source of APF while fresh horse manure contained no activity. This shows that intestinal synthesis of APF does not occur in the horse.

A supplement of a combination of several known crystalline vitamins showed the same growth stimulating effect as APF when added to the basal chick assay diet. However, the growth effects produced by the vitamins and APF were different and additive.

A charcoal adsorbate of vitamin B_{12} was shown to have APF activity.

Mushrooms were found to contain no vitamin B_{12} by the chick assay method employed. (Experiment Station Record)

MORGAN, C. L., M. A. BOONE and C. P. WILLIMON. *(South Carolina Exp. Sta.)* COMPONENTS OF A BROILER RATION. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Mississippi, February, 1950,* page 143.

The Connecticut Broiler Ration may be modified by the substitution of fish solubles for liver meal and riboflavin for butyl fermentation product. Growth rates on the Connecticut Broiler Ration and various modifications of this diet produced more rapid growth and greater feed efficiency than the chick starting ration previously used at this station (Clemson Starting Ration No. 1). Clemson Starting Ration No. 2, developed from modifications of the Connecticut Broiler Ration, has been found to produce a rate of gain and efficiency of feed utilization similar to that obtained from the Connecticut Ration. The ingredients of this ration are readily obtainable. (Experiment Station Record)

MUSHETT, CHARLES W., and WALTHER H. OTT. *(Merck Inst., Rahway, N. J.)* INFLUENCE OF CRYSTALLINE VITAMIN B_{12} ON GIZZARD EROSIONS IN CHICKS. *Poultry Sci. 28:* 850-854. 1949.—Chicks fed a ration containing 70% soybean meal and all recognized nutrients including crystalline vit. B_{12} showed fewer and less severe gizzard erosions than chicks given the same diet without vit. B_{12}. A level of 2.5 *µg.* vit. B_{12} per kg. of basal diet almost completely prevented the gizzard disorder in chicks from hens fed a commercial breeder ration; 10 *µg.* of vit. B_{12} per kg. of basal diet were required for a similar effect in chicks from hens fed an all-vegetable ration. The hemoglobin levels in chicks which received vitamin B_{12} were approx. the same as those in the chicks fed the basal ration without vit. B_{12}.—*Authors.* (Biological Abstracts)

NORRIS, L. C., C. W. CARLSON, and R. F. MILLER, *Ithaca. (New York Exp. Sta., Ithaca.)* VITAMIN B_{12} AND THE ANIMAL PROTEIN FACTOR. *Farm Research, Vol. XVI, No. 2, April 1950,* page 3.

The benefits obtained by including fish meal in this ration were not due solely to vitamin B_{12} but to the presence of an unidentified factor or factors in the products. The animal protein factor is composed of an unknown vitamin, or vitamins, and vitamin B_{12}.

We can extend the use of the somewhat limited supply of meat scrap and fish meal in rations for chicks and breeders by combining products supplying vitamin B_{12} with those containing the unidentified vitamin or vitamins. Vitamin B_{12} is now being produced in reasonably large quantities by fermentation procedures. The unidentified vitamin or vitamins we have found in other experimental work can be furnished by means of

dried whey and dried distillers' solubles as well as by dried brewers' yeast. (Experiment Station Record)

OLSSON, NILS. *(Roy. Agric. Coll., Uppsala.)* INVESTIGATIONS ON THE VITAMIN D REQUIREMENTS OF CHICKS, POULTS, DUCKLINGS AND GOSLINGS. *Kungl. Lantbruksh*ö*gskolans Annaler 16:* 1-38. 1949.—The vitamin D content of the cod liver used was tested against crystalline vitamin D_3 of which 0.01 μg. was called one Chick Unit. The vitamin content of the cod liver oil was equal to 180 Chick Units per g. The vitamin D requirement of White Leghorn chicks was found to be 250-300 Chick Units per kg. of food containing about 1.65% Ca and 0.7% P. Rhode Island Red chicks were found to have 2.7 times the vitamin D requirements of White Leghorn chicks. The vitamin requirements of White Sussex chicks were about 1.6 times greater than those of the White Leghorns. White Holland turkeys on a diet containing about 1.5% Ca and 0.72% P required about 700-800 Chick Units of vitamin D per kg. of food in the absence of antirachitic light. Peking ducklings reared in cages in the absence of antirachitic light required about 800 Chick Units of vitamin D per kg. of food containing 1.6-2% Ca and 0.8-1% P, with Ca:P ratio of 1.9-2.0:1. White Italian goslings required for proper growth and bone calcification about 300 Chick Units of vitamin D. Toulouse goslings and other goose breeds with high growth rates required at least 350 Chick Units of vitamin D per kg. of food. Great differences occurred between individual goslings. Calcification of the tarso-metatarsal bones was completed in geese and ducks in about 8 weeks after hatching. In the case of chickens and trukeys 16-24 weeks were necessary.—*A. L. Bakke.* (Biological Abstracts)

O'NEIL, J. B., J. R. JOWSEY, C. C. LEE, and J. W. T. SPINKS. DISTRIBUTION OF P^{32} IN CHICK EMBRYOS. *Canadian Jour. Res. Sect. D. Zool. Sci. 27:* 223-232. 1949.—By feeding a hen repeated daily doses of NaH_2PO_4 of equal P^{32} activity, eggs with high and nearly uniform P^{32} content were obtained for use in hatching expts. Eleven eggs were incubated. The embryos and chicks that died during or after incubation were dissected and analyzed for total and specific activities in the various fractions. Two of the chicks, both females, are still living. They are being raised so that observations may be made on their ability to reproduce and the effect of the radio-activity, if any, on their offspring.—*Auth. abst.* (Biological Abstracts)

PATRICK, HOMER. *(Tennessee Exp. Sta.)* VITAMIN B_{12} AND FISH BY-PRODUCTS IN RATIONS FOR BELTSVILLE WHITE TURKEY POULTS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950,* page 145.

The failure of poults to respond to vitamin B_{12} and the response to crude animal protein emphasizes the requirement of the turkey poult for nutrients other than vitamin B_{12}. (Experiment Station Record)

PREBLUDA, H. J. NEW TRENDS IN ANIMAL NUTRITION. *The Feed Bag, April, 1950,* Vol. 26, No. 4, page 15.

In the near future, the acetate and palmitate esters of synthetic vitamin A will offer spirited competition to domestic and imported fish liver oils. Although synthetic vitamin A is now higher in cost than the natural vitamin in fish oils, it is expected that the availablity of the synthetic product will stabilize the price structure and minimize the wide price fluctuations which have existed in the past. The synthetic product also offers the advantage of freedom from fish odor and taste which is sometimes objectionable from a carcass quality standpoint. One USP unit is defined as 0.300 micrograms of vitamin A alcohol or 0.344 micrograms of vitamin A acetate.

The carotene content of eggs from hens fed alfalfa was much higher than that obtained from eggs of animals receiving the oil product. It has been suggested that alfalfa carries a factor which assists in the utilization of carotene.

Certain types of fermentation products have shown remarkable cor-

relation with regard to vitamin B_{12}. University of Connecticut workers have reported that APF concentrates improve the feed efficiency of rations even though they contain a total as high as 7.5 per cent of animal protein concentrates.

The feed requirements of various animals with regard to vitamin B_{12}:

Poultry—growing and breeding rations 12-15 milligrams.
Swine—growing and fattening 20-25 milligrams.
Calves—16-18 milligrams.

A considerable increase in the requirement for vitamin B_{12} has been found upon raising the protein content of the ration. The most critical need for vitamin B_{12} in animals is during embryonic development and for the first few weeks of life after birth.

Some of the growth factors in APF other than vitamin B_{12} are present in such materials as dried whey, alfalfa meal, fish meal, fermentation solubles and in special strains of yeast.

From most of the evidence it is apparent that there are at least two additional factors, other than vitamin B_{12}, which are part of the so-called "animal protein factor," and required by poultry as well as swine. There is some evidence that some APF fermentation products contain a factor which is not found in fish products.

There is a trend toward accepting the use of lower quantities of methionine (1-2 pounds per ton of finished feed) in combination with APF fermentation products, because of an interrelationship between vitamin B_{12} in APF products and the added methionine. It has been found that choline requirements of the animal are not as great in the presence of vitamin B_{12}; however, the reverse is not true. (Experiment Station Record)

QUICKE, G. V. and J. H. KELLERMANN. STUDIES ON INTERMITTENT INANITION IN THE FEEDING OF POULTRY. *Science Bulletin No. 282. Agricultural Research Series No. 11. Union of South Africa.*

(1) From the data obtained in this work it may be concluded that weekly forty-eight-hour fasts over a period of 24 weeks had no appreciable effect on the growth of cockerels, nor on the chemical composition of their breast and leg muscles.

(2) Although the birds were already physiologically mature (34 weeks of age) at the conclusion of the experiment, a study will have to be made of the reproductive performance of cocks as influenced by intermittent inanition, before this method of feeding can be recommended.

(3) A saving of 17 per cent in food consumption without any detrimental effect on the growth of cockerels is of importance from an economical point of view.

(4) Contrary to the cockerels, pullets were affected detrimentally by the periodical fasts employed. This is especially evident during the laying period, the main effects being a drop in food intake, growth-rate and egg-production. (Experiment Station Record)

QUISENBERRY, J. H. *(Texas Exp. Sta.)* USE OF HIGH EFFICIENCY RATIONS FOR EGG PRODUCTION. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., Ferbuary, 1950,* page. 148. (Experiment Station Record)

SCOTT, M. L. *Cornell Exp. Sta., Ithaca)* STUDIES ON THE ENLARGED HOCK DISORDER (PEROSIS) IN TURKEYS. *Journal of Nutrition, April 10, 1950, 40:* 611.

The results presented in this report further emphasize the primary importance of choline in the prevention of perosis in turkeys. In no instance was perosis completely prevented as long as the choline level in the diet was below 850 mg per pound.

When animal protein was omitted from the diet, choline was ineffective in completely preventing perosis unless the diet also contained betaine or a relatively high level of glycine and vitamin B_{12}.

Both sarcosine and creatine were as active in the prevention of perosis as betaine, and more active than glycine, under similar conditions. (Experiment Station Record)

SHERWOOD, R. M. and J. R. COUCH. *(Texas Exp. Sta.)* THE USE OF AN APF (B_{12}) CONCENTRATE IN SIMPLIFIED CHICK RATIONS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950,* page 146. (Experiment Station Record)

STEWART, WM. I. and C. W. UPP. *(Louisiana Exp. Sta.)* COMPARISON OF MASH, PELLETS AND GRANULES AS AFFECTING RATE OF GROWTH AND FEED EFFICIENCY. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February, 1950, page 144.*

In these trials the form of feed did not greatly affect the rate of growth nor the feed efficiency. (Experiment Station Record)

TARR, H. L. A. and B. A. SOUTHCOTT. VITAMIN B_{12}-ACTIVE SUBSTANCES IN FISH PRODUCTS. *Decennial Conference Program, Institute of Food Technologists, May 1950, Chicago,* page 56.

Fish kidney is a considerably richer source of vitamin B_{12} than is fish liver. Other tissues, including spleen, digestive tract, eggs, milts and flesh, are progressively poorer sources. Very marked variations in the vitamin B_{12} potency of fish meals (70 to 1500 μg./g.), solubles (180 to 600 μg./g.) and condensed solubles (80 to 660 μg./g.) were found. (Experiment Station Record)

THOMPSON, H. T., L. S. DIETRICH, and C. A. ELVEHJEM. *(Univ. of Wisconsin)* THE USE OF LACTOBACILLUS LEICHMANNII IN THE ESTIMATION OF VITAMIN B_{12} ACTIVITY. *Journal of Biological Chemistry, 1950 184:* 175.

Owing to the importance of vitamin B_{12} in animal nutrition, a convenient method for its estimation in natural materials and foodstuffs is of definite value. Certain lactic acid bacteria have been shown to respond to graded levels of vitamin B_{12} and related substances (1-3). In the present paper a method for the estimation of the vitamin B_{12} activity of natural materials through the use of *Lactobacillus leichmannii* is described. (Experiment Station Record)

SERFONTEIN, P. J. BLOODMEAL IN POULTRY RATIONS. *Union S. Africa Dept. Agric. and Forest, Bull. 280: 1-21.* 1947.—Five expts. are reported showing no significant differences from blood meal obtained from various sources; blood meal may constitute as much as ½ of the protein in the chick ration without serious results; fish meal had higher value with blood meal than meat meal; meat meal can be replaced by 50% blood meal but higher than 25% is not advised; and the laying ration cannot successfully use 50% blood meal as a protein source. Vitamin deficiencies are indicated.—*E. Mortensen.* (Biological Abstracts)

SINGSEN, EDWIN P. *(U. Connecticut, Storrs.)* THE EFFECT OF PROTEIN LEVEL ON GROWTH AND EFFICIENCY OF FEED UTILIZATION. *Poultry Sci. 28:* 713-717. 1949.—The effect of protein level on the rate of growth and efficiency of feed utilization of chicks was studied. Four expts. employing diets containing approx. 20 and 28% protein have been completed. All lots were fed the 20% diet after the 3d week. The diets supported excellent growth and were considered adequate in all known nutrients. A combination of fish meal, meat scrap and soybean meal were used as the protein supplement in both diets. Sexed chicks of the R. I. Red males x B. P. Rock females cross were used in all expts. and all lots were run either in duplicate or triplicate to minimize the influence of chance on the results. The following results are from the 4th expt. only, but are representative of all 4 expts. The avg. body wts. of the males at 8 weeks of age were 1102 and 1113 g. on the 20% and 28% protein diets, respectively, and those of the females were 939 and 941 g. The avg. cumulative feed efficiencies at 8 weeks of age were 0.437 and 0.445 for the males on the 20% and 28% diets, respectively, and 0.419 and 0.432 for the females. It is concluded that the difference between the 2 diets is insufficient to warrant the mixing of a high protein diet for starting chicks.—*E. P. Singsen.* (Biological Abstracts)

SPINKS, J. W. T., C. C. LEE, and J. B. O'NEIL. THE USE OF P^{32} LABELED GLYCEROPHOSPHATE IN THE STUDY OF YOLK PHOSPHOLIPIDS. *Canadian Jour. Res. Sect. B. Chem. Sci. 27:* 629-637. 1949.—Labeled Na glycerophosphate has been prepared by phosphorylating glycerol with Na dihydrogen phosphate containing P^{32}. After the labeled Na glycerophosphate had been fed to a laying hen, radiophosphorus from glycerophosphate appeared in the shells, whites, and yolks of the eggs. The uptake in different eggs followed a pattern similar to that found for inorganic phosphate, the maximum occurring at the 4th or 5th egg. Comparative studies using P^{32} labeled Na glycerophosphate and trisodium phosphate indicate that the rate of utilization of the P from glycerophosphate is less than the rate of utilization of the P from inorganic phosphate. The possibility of an enzymatic hydrolysis of glycerophosphate followed by the incorporation of the resulting phosphoric acid into the phospholipids and the phosphorylation of lower glycerides (partially hydrolyzed fat) by inorganic phosphate as a mechanism for phospholipid formation is discussed.—*Auth. abst.* (Biological Abstracts)

TEMPERTON, H., and F. J. DUDLEY. *(Nation. Inst. Poultry Husbandry, Shropshire, Eng.)* VITAMIN-A METABOLISM IN POULTRY. I. THE QUANTITATIVE REQUIREMENTS OF VITAMIN A FOR POULTRY WITH SPECIAL REFERENCE TO THE USE OF MAIZE AND DRIED GRASS FOR MEETING THESE REQUIREMENTS. II. AN EXPERIMENTAL STUDY OF THE USE OF THE PRO-VITAMIN-A IN DRIED GRASS AS THE SOLE DIETARY SOURCE OF VITAMIN A FOR ADULT FOWLS AND THEIR PROGENY. *Harper Adams Utility Poultry Jour. 33:* 55-92. Illus. 1948.—I. The literature is reviewed pertaining to the recommended allowances of vitamin A for fowls. The variability in initial vitamin A activity of yellow maize makes it unreliable as the sole source of vitamin A when desirable levels of this feed are used. The use of dried greenfood as the sole source of provitamin-A is discussed. Tables showing the percentages of maize and dried greenfood required in a diet to provide varying levels of vitamin A are included. II. The results are given of an investigation to test the efficiency of 3 grades of dried grass as the source of vitamin A. These meals contained, when manufactured, a β-carotene content of 80, 225, and 366 mg./kg., respectively. When fed at a level of 5% of the total ration to breeding stock and to their progeny from hatching to 20 weeks of age, satisfactory results were obtained from the lowest grade of dried grass meal. All chicks fed the control ration without grass meal died before 8 weeks of age regardless of their parent's ration. Chicks lived and grew satisfactorily when fed rations containing grass meals whether or not the parents had received grass meal. The basal ration fed to the breeders resulted in lowered egg production, loss of body wt., appearance of secondary lesions and lowered hatchability but did not affect fertility. Breeding males fed the control ration for prolonged periods developed severe symptoms of vitamin A deficiency followed by death.—*T. B. Clark.* (Biological Abstracts)

WEEK, ERLING F., and FRANK J. SEVIGNE. VITAMIN A UTILIZATION STUDIES. III. THE UTILIZATION OF VITAMIN A ALCOHOL, VITAMIN A ACETATE AND VITAMIN A NATURAL ESTERS BY HUMANS. *Journal of Nutrition, 40:* 563. 1950.—For the male subjects, vitamin A alcohol showed greater biological efficacy than vitamin A acetate which, in turn, was superior to the natural ester forms.

The addition of 300 mg. of tocopherols to the vitamin A alcohol supplements had no appreciable effect on vitamin A absorption.

After ingestion of high dosages of the vitamin, the increased vitamin A in the blood serum was present as the ester, irrespective of the chemical form of the vitamin administered in the supplement. (Experiment Station Record)

WHARTON, F. D., L. D. MATTERSON, H. M. SCOTT, and C. I. BLISS. (Agric. Expt. Sta., Storrs, Conn.) THE VITAMIN A RE-

QUIREMENT OF GROWING TURKEYS. *Jour. Nutrition 39*, 543-554. 1949.—Three expts. were conducted to determine the vitamin A requirements of growing turkeys. The basal diet was fortified with assayed cod liver oil to provide levels of 150, 300, 600, 1200, 2400, 4800, and 7200 I.U. of vitamin A/100 g. of feed. Histological examination of the brain at 2, 4, 6, and 8 weeks of age revealed no lesions that could be ascribed to vitamin A deficiency. Nasal lesions specific for A-avitaminosis in the chick were found only in 4-week-old birds receiving no supplemental vitamin A. Vitamin A levels of blood plasma and liver were detd. at biweekly intervals. Liver stores of vitamin A increased with age in those lots receiving more than 1200 I.U. of vitamin A/100 g. of feed, and were depleted with age in those lots receiving less. No significant increase in plasma levels of vitamin A was found in birds receiving 1200 I.U. of vitamin A/100 g. of feed, or more. The plasma level decreased rapidly with dosages of less than 1200 I.U. of vitamin A/100 g. of feed. Statistical analysis of the linear coeff. used in calculating the growth curve for each bird (Wishart technique) revealed the point of greatest response to be 1683 I.U. of vitamin A/100 g. of feed.—*Auth.* (courtesy Wistar Bibl. Serv.).

WILLIAMS, C. C., and C. W. UPP. *(Louisiana Exp. Sta.)* HIGH ENERGY-LOW FIBER RATIONS FOR BROILERS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss.* February, 1950, page 146.—(Experiment Station Record)

DISTILLERS' DRIED SOLUBLES AS A SOURCE OF B COMPLEX VITAMINS FOR POULTRY RATIONS. DISTILLERS' SOLUBLES AS A SOURCE OF PANTOTHENIC ACID. *Sixty-Second Annual Report of the Director, Purdue University, Indiana, for the year ending June 30, 1949*, page 21.—(Experiment Station Record)

EVALUATION OF FISHERY PRODUCTS AS SUPPLEMENTS IN POULTRY RATIONS. CHOLINE, BETAINE AND METHIONINE AS SUPPLEMENTS FOR CORN AND SOYBEAN OIL MEAL CHICK RATIONS. *Sixty-second Annual Report of the Director, Purdue, Indiana, for the year ending June 30, 1949*, page 19.—These results indicate that choline, betaine, and methionine were all effective in supplementing the simplified ration. However, betaine at 0.3 and 0.4% levels appeared to have higher supplementary value than either choline or methionine. (Experiment Station Record)

FEED CAN AFFECT BACTERIA IN CHICKENS' INTESTINES. *What's New in Farm Science, Annual Report, Part One, Wisconsin Bulletin 487*, June 1949, page 47.—A biotin-deficient ration containing dextrin resulted in high levels of coliform organisms, and low levels of lactic acid bacteria in cecal pouch contents. Apparently, the organisms supplied the hens with biotin—at least they showed no signs of biotin deficiency. Common sugar in the rations limited the number of coliform organisms, and birds fed on such a ration lacking in biotin suffered acute biotin deficiencies. (Experiment Station Record)

FLUID VERSUS POWDERED MILK FOR CHICKS. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946*, page 80.—Six weeks of feeding resulted in largest gains for the skim-milk fed group of chicks. The average gains were 15.4, 12.8 and 12.1 ounces, respectively, for the skim-milk, 2 percent milk powder and 4 percent milk powder fed groups. The cost of feeding per chick was 1.0 cent and 1.3 cent greater for the 2 and 4 percent milk powder fed groups respectively than for the skim-milk group.

In this test skim-milk had a marked "loosening" effect on the chick droppings. This resulted in moist floor litter sooner than in the quarters occupied by the chicks receiving powdered milk. It was also noted that the livability of the chicks in all three groups was over 96 percent. (Experiment Station Record)

HIGH VERSUS LOW GRADE WHEAT FOR LAYING HENS. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946*, page 82.—In general, the low grade wheat appeared to be an economical grain to feed laying hens. It had the same effect on hen livability and weight increase and also on egg size as the high grade wheat. (Experiment Station Record)

HIGH CALCIUM VERSUS LOW CALCIUM LIMESTONE FOR EGG PRODUCTION. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946*, page 84.—The conclusion of this test is that high calcium limestone grit produces a slightly greater percentage of hard-shelled eggs all year than low calcium limestone. Moreover, the high calcium appears to be more desirable physically for the laying hens. However, the low calcium limestone promoted greatest egg production. (Experiment Station Record)

INCREASED VITAMIN E REQUIREMENT OF CHICKS IN HYPERTHYROIDISM. *Nutrition Reviews, May, 1950, 8:* 141.—Vitamin E must thus be added to the list of vitamins required in enhanced amounts by hyperthyroid animals. The observations have possible utility in development of a more rapid and accurate bioassay for vitamin E. They may also have clinical implications. Sufficient results with laboratory animals have now been reported to indicate that requirements for several vitamins are increased during hyperthyroidism, and that by supplying increased amounts of such nutritional factors required, many, if not all, of the deleterious effects of hyperthyroidism can be prevented. (Experiment Station Record)

LIMESTONE GRIT AND OYSTER SHELLS FOR EGG SHELL STRENGTH. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946*, page 83.—In these tests limestone grit and oyster shells appeared to be equally efficient in promoting production of hard-shelled eggs. Evidently other factors are responsible for the inconsistent production of hard-shelled eggs throughout the year. (Experiment Station Record)

MEAT MEAL PLUS MILK FOR CHICKS. *Dominion Experimental Station, Morden, Man. Progress Report 1938-46*, page 81.—The greatest gain in chick weight was recorded for the two groups receiving the meat meal plus skim-milk. The 22-ounce gain per chick made in eight weeks was the same whether 5 percent or 10 percent meat meal was fed in addition to the skim-milk. The groups not receiving skim-milk made gains of 17.5 ounces per chick for the 10 percent meat meal feed and 13.5 ounces per chick for the 5 percent meat meal feed.

It was observed that chicks getting more than 10 percent meat meal in their mash developed perosis or crooked toes. However, skim-milk or milk powder fed as a supplement prevented perosis and encouraged maximum growth. (Experiment Station Record)

PROTEIN FOR LAYING HENS. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946*, page 81.—In general, the test data indicated no significant difference between the commercial concentrate fed group and the meat meal fed group, in regard to total egg production, egg size, body weight per hen or total feed requirements. The commercial concentrate appeared to be the most satisfactory source of protein for laying hens. As a rule, the concentrate is a well balanced feed mixture. Meat meal, as a source of protein, must be mixed with other feed materials and the work of proportioning these is laborious. (Experiment Station Record)

THE COMPARATIVE VALUE OF ANIMAL AND VEGETABLE PROTEINS AND THE ROLE OF FREE CHOICE IN THE DIET OF THE BOBWHITE QUAIL. *Sixty-Second Annual Report of the Director, Purdue University, Indiana, for the year ending June 30, 1949*, page 23. —Excellent growth and high livability were obtained on simplified rations, entirely devoid of animal proteins. No rations containing animal

proteins gave better results than the simplified rations, the composition of which was 95% corn and soybean oil meal. (Experiment Station Record)

THE INFLUENCE OF STILBESTROL AND THIOURACIL UPON THE EFFICIENCY OF FEED UTILIZATION IN THE DOMESTIC FOWL. *Sixty-Second Annual Report of the Director, Purdue University, Indiana, for the year ending June 30, 1949*, page 19.—Birds administered thiouracil and stilbestrol were the most efficient and were over 40% more efficient than the controls in conversion of feed energy to edible energy. Analyses of edible carcass indicated that the protein and moisture composition of the carcasses were decreased and fat composition was increased in thiouracil and stilbestrol lots when compared with the controls. Average rate of gain in the control, thiouracil, stilbestrol and thiouracil and stilbestrol lots was 804, 572, 856, and 742 gm. respectively. Finish grade, an index of subcutaneous fat deposition, and dressing percentage were improved significantly by the combination thiouracil and stilbestrol treatment. (Experiment Station Record)

THE SUPPLEMENTARY VALUE OF SYNTHETIC VITAMINS AND VITAMIN RICH FEEDS FOR GRAIN AND SOY BEAN OIL MEAL POULTRY RATIONS. FISHERY PRODUCTS SUPPLEMENT PRACTICAL CHICK RATIONS. *Sixty-Second Annual Report of the Director, Purdue Univ., Indiana, for the year ending June 30, 1949*, page 20.—A practical chick starting ration, consisting of corn, soybean oil meal, alfalfa leaf meal, corn gluten meal B-Y riboflavin concentrate, a vitamin D concentrate, and a simple mineral mixture, has been satisfactorily supplemented with various fishery products. When a new sample of fish solubles was compared with a sample which had been stored for two years in a refrigerator and another sample which had been stored two years in a garage, no difference in supplementary nutritional value were shown. One percent (dry basis) of fish solubles resulted in as satisfactory growth response as 1.5% in the type of ration fed. (Experiment Station Record)

VITAMIN B_{12}, FOLIC ACID, AND CHOLINE INTERRELATIONS. *Nutrition Reviews, May, 1950, 8:* 145.—It was possible to demonstrate an interrelation between folic acid and B_{12}, and, in some instances, a further relation to choline. Furthermore, the effects of folic acid and B_{12} seem to be additive, suggesting that each substance exerts a separate effect or produces the effect by a different mechanism. The relation of these vitamins to choline may explain a part, but only a part, of their effect. (Experiment Station Record)

VITAMIN C CAN AFFECT CHICKS' HEMOGLOBIN. *What's New in Farm Science, Annual Report, Part One, Wisconsin Bulletin 487, June 1949*, page 47.—Laying hens need vitamin C for top egg production, and one experiment showed that vitamin C increases the growth rate of chicks. Since that experiment, purification of the rations has given results which are not consistent. At times vitamin C did not stimulate chicks' growth when synthetic folic acid, another vitamin, replaced the crude folic acid concentrate.

When the carbohydrate in the diet was dextrin, vitamin C improved hemoglobin production when only low levels of folic acid were supplied. But when the amount of folic acid increased, a point was reached where vitamin C no longer caused improvement in the hemoglobin levels. (Experiment Station Record)

PATHOLOGY

DAWSON, I. M., and W. J. ELFORD. E.M. STUDIES OF VIRUS-FOWL RED CELL INTERACTION. C°E. M. STUDIES ON THE INTERACTION OF CERTAIN VIRUSES WITH FOWL RED CELL

MEMBRANES.") *Nature, London*, 1949, 163, 63; 1 fig., 7 refs.). The adsorption of influenza, Newcastle disease, mumps, and fowl plague viruses on membranes of lysed fowl red cells has been studied. Micrographs show a general random distribution of virus bodies on the cell membrane, with no evident pattern. As more virus is added a single close matt covers the entire membrane. Virus concentrations can be reliably estimated by counting the number of bodies absorbed per unit area of membrane. R. R.—*This abstract is found in the Journal of the Royal Microscopical Society, December*, 1949, Series III, Vol. LXIX, *No. 11360 in World List Scientific Periodicals, Page 252.* (Experiment Station Record)

GROSCHKE, A. C., J. A. DAVIDSON, R. J. EVANS, S. NAROTSKY, P. A. HAWKINS, and E. P. REINEKE. *(Michigan State Coll., East Lansing.)* THE EFFECT OF DIPHENOLS AND BISPHENOLS ON GROWTH AND CONTROL OF CECAL COCCIDIOSIS IN BROILERS. *Poultry Sci. 28:* 811-817. 1949—Four bisphenols namely, (1) 4,4' isopropylidenedi-O-cresol, (2) 2,2' methylene bis (4-chlorophenol), (3) 4,4' ethylamylidenediphenol, and (4) 4,4' isopropylidene bis (2-isopropylphenol) were fed to S. C. White Leghorn male chicks continuously in the mash at a level of 0.3% for a period 0-12 weeks in 2 expts. In the 1st expt. the bisphenols were compared with continuous feeding in the mash of sulfamethazine, sulfaquinoxaline, and sulfaguanidine as anticoccidial agents for floor-raised broilers. The results indicated that the bisphenols under the conditions employed gave a high degree of protection against coccidial infection and allowed normal growth to 12 weeks of age. In the 2d expt. the bisphenols had no detrimental effects on shank pigmentation, market quality of dressed carcasses or flavor of meat in battery raised broilers. When tested for estrogen-like activity, as measured by testes wt. and blood fat, against other known fattening agents (dianisylhexene, 6-methyl thiouracil, thiouracil, and stilbestrol), one compound (3) tended to depress testes wt. slightly and another (2) tended to increase testes wt. Significant changes in blood fat levels were not observed as a result of continuous feeding of bisphenols.—*A. C. Groschke.* (Biological Abstracts)

HARWOOD, PAUL D., assignor to Dr. Hess and Clark, Inc. (Ashland, Ohio.) COCCIDIOSTATIC COMPOSITION. *U. S. Patent 2,472,422;* Appln. Aug. 21, 1946; Issd. June 7, 1949.—A coccidiostatic composition for the prevention and treatment of coccidiosis in poultry consists of a mash feed and 0.03-1% by wt. of p-nitrochlorobenzene, p-nitrobromobenzene, or p-nitroacetanilides. Of groups of fifteen 39-day-old chicks given 1,000,000 oocysts of *Eimeria tenella* and fed chick mash containing 0.1% p-nitromethylaniline, p-nitrethylacetanilid, p-nitrophenylacetonitrile, and p-nitroaniline-o-sulfonic acid, no chicks died while all chicks similarly treated and fed chick mash died. (Biological Abstracts)

JOHNSON, JULIUS E., DORSEY R. MUSSELL, and ANDREW J. DIETZLER. *(Dow Chem. Co., Midland, Mich.)* THE ACTIVITY OF BISPHENOLS AND DIPHENOLS AGAINST CECAL COCCIDIOSIS (E. TENELLA) IN CHICKENS. *Poultry Sci. 28:* 802-810. 1949.— Laboratory tests have demonstrated that several alkyli-denediphenols (bisphenols and diphenols) give protection against *Eimeria tenella* infection in chickens. These compounds affect only the early stages of the infection in birds. To be effective, medication must be initiated before exposure to the parasite. pp'-(l-Ethylamylidene) diphenol, 4,4'-isopropylidene bis (2-isopropylphenol) and 4,4'-isopropylidenedi-o-cresol were respectively 1.5, 2 and 2-2.5 times as active as sulfaguanidine in prophylactic tests. These bisphenols were fed continuously in the diet of chickens (0.3%) without interfering with the growth, thriftiness or feeding efficiency.—*J. E. Johnson.* (Biological Abstracts)

WALETZKY, E., J. H. CLARK, and H. W. MARSON. NEW CHEMOTHERAPEUTIC AGENTS IN ENTEROHEPATITIS (BLACKHEAD) OF TURKEYS. *Science, June 30, 1950, 111(2896):*

720.—Enheptin-T is highly active in enterohepatitis produced with *Heterakis* ova. Complete prevention of mortality was obtained when 14 days of treatment was begun not later than 72 hours after a single oral inoculation. With treatments begun later, there was generally some reduction in mortality, and very few deaths occurred until more than one week after treatment stopped, even when treatment was not begun until the appearance of clinical symptoms (13 days). This suggests that longer treatments might have saved most of the birds. The activity of Eneheptin-T, and of Enheptin-P, has been confirmed by others in naturally occurring field outbreaks and will be reported elsewhere, as will full details of the above results. (Experiment Station Record)

A STUDY OF THE AVIAN LEUKOSIS BY THE USE OF CHICK EMBRYO TECHNIQUES. *Sixty-Second Annual Report of the Director, Purdue University, Indiana, for the year ending June 30, 1949*, page 23.—Visceral lymphomatosis can be transmitted to chick embryos with considerable consistency with cell-containing tissue from infected birds.

Transmission to embryos can be accomplished with suspensions of blood or tumorous organs from infected birds, including liver, spleen, ovary and muscle, but in general blood is the most effective and dependable inoculum.

Visceral lymphomatosis may be transmitted from chickens to turkeys with difficulty, if at all. The possibility that transmission by intramuscular inoculation with R P L Strain 16 was accomplished on a subclinical level was suggested. (Experiment Station Record)

NASAL VACCINE LAWS. *Hatchery and Feed, 24:* 35, April, 1950. —In the following states, permits from the State Veterinarian are required to purchase or use the new so-called Intranasal Vaccine for Newcastle disease:

Idaho, Michigan, Mississippi, Montana, New Hampshire, North Carolina, North Dakota, Oregon, Rhode Island, South Dakota, Tennessee, Vermont and Wyoming.

The use of this vaccine is currently prohibited in Iowa and Wisconsin.

Regulations governing the distribution and use of this vaccine have not been set up as yet in Georgia and Nebraska.

In Arizona and Utah the vaccine can be legally sold only by or on the written order of a licensed veterinarian.

In all other states (28) which include most of the important poultry states, there are no laws or regulations restricting the distribution and use of nasal vaccine.

Georgia is said to be about to promulgate regulations. In Vermont and Rhode Island the dealer may secure the vaccine without a permit, but can sell only to flockowners who show a permit from the State Veterinarian. (Experiment Station Record)

POULTRY: SPRING PULLORUM TESTING SHOWING VALUE. *Oklahoma Farm Research Flashes, May 1950*, page 6.—The new practice of pullorum testing hatchery flocks in April, May or June has increased viability of chicks hatched in summer and late spring, and also reduced the amount of pullorum in pullet flocks the following fall, according to reports of hatcherymen cooperating in the Oklahoma Poultry Improvement Association. (Experiment Station Record)

POULTRY PRODUCTS AND MARKETING

CLINGER, CAROLINE PERKINS, ARLENE YOUNG, INEZ PRUDENT, and A. R. WINTER. *(Ohio State University, Columbus, Ohio.)* SOME FACTORS INFLUENCING THE FUNCTIONAL PROPERTIES OF EGG WHITES. *Decennial Conference Program, Institute of Food Technologists, May 1950, Chicago*, page 50. (Experiment Station Record)

DAVIDSON, J. A., L. E. DAWSON, and C. C. SHEPPARD. THE OCCURRENCE OF SOUR EGGS IN STORED EGGS. *Quarterly Bulletin, Michigan State College, May 1950, 32:* 526.—The incidence of souring in storage eggs is increased materially by washing the eggs prior to oil treating and storage. Eighty-one percent of the sour eggs found in the lots of eggs which had been either clean or washed occurred in the washed eggs.

Storing naturally clean eggs minimizes the risk of eggs souring, but does not eliminate it.

The candled quality of the washed eggs declined slightly more than did the candled quality of clean eggs.

The broken-out quality of washed and clean eggs declined at the same rate throughout the 7 months' storage period.

Sour eggs are not generally detected by the candling technique. (Experiment Station Record)

DAWSON, L. E., and J. A. DAVIDSON. EGG PRODUCTION AND MARKETING PRACTICES ON 206 MICHIGAN FARMS. *The Quarterly Bulletin, Michigan State College, February 1950, 32:* 402. (Experiment Station Record)

EARLE, WENDELL. *(New York Exp. Sta., Ithaca, N. Y.)* EGG QUALITY VARIES WITH HANDLING. *Farm Research, Vol. XVI, No. 2, April 1950,* page 4.—The management practices considered desirable were: keeping layers confined, gathering eggs three times or more daily, and keeping no males in the laying flock. Separately, these practices did not explain the variation among farms in the number of AA quality eggs.

The farms that followed only one of the desirable practices had the lowest percentage of AA eggs during each period. As the number of practices followed increased, the percentage of AA eggs increased also.

The higher temperature in the egg rooms during August and May might have caused the detrimental effects of these practices to show more during those two months than during cooler weather.

Humidity exerted the greatest influence on egg quality when the temperatures in the egg-holding rooms were relatively high. In August, when the temperature averaged 68° F., the lots with high humidity had 62 percent AA quality eggs, while the lots with low humidity had 50 percent AA eggs. (Experiment Station Record)

EVANS, ROBERT JOHN, HELEN A. BUTTS, J. A. DAVIDSON, and SELMA L. BANDEMER. *(Michigan State Coll., East Lansing.)* THE AMINO ACID CONTENT OF FRESH AND STORED SHELL EGGS. I. LEUCINE, ISOLEUCINE, VALINE, GLYCINE, SERINE, THREONINE, ASPARTIC ACID, AND GLUTAMIC ACID. *Poultry Sci. 28:* 691-696. 1949.—The amino acid content of fresh eggs and eggs stored 9, 18, 23, and 26 mos. were detd. by microbiological assay. Albumen protein contained higher percentages of isoleucine, valine, glycine, aspartic acid and glutamic acid and lower percentages of serine and threonine than yolk protein. The concn. of leucine was similar in both proteins. More glutamic acid was present than any other amino acid. There was no appreciable change in the concn. of leucine, isoleucine, valine, glycine, aspartic acid and glutamic acid in egg proteins during storage, but there was a decrease in serine and threonine. The fewest mg. of each amino acid per egg albumen were in eggs stored for 9 mos., and per egg yolk, for the 26 mos. period.—*S. L. Bandemer.* (Biological Abstracts)

EVANS, ROBERT JOHN, J. A. DAVIDSON, SELMA L. BANDEMER, and HELEN A. BUTTS. *(Michigan State Coll., East Lansing.)* THE AMINO ACID CONTENT OF FRESH AND STORED SHELL EGGS. II. ARGININE, HISTIDINE, LYSINE, METHIONINE, CYSTINE, TYROSINE, TRYPTOPHAN, PHENYLALANINE, AND PROLINE. *Poultry Sci. 28:* 697-702. 1949.—The amino acid content of fresh

eggs and eggs stored, 9, 18, 23 and 26 mos. was detd. by microbiological assay. Cystine was also detd. colorimetrically with good agreement. Albumen protein contained higher percentages of methionine, cystine and phenylalanine, and lower percentages of arginine, histidine, lysine and proline than yolk proteins. The concn. of tyrosine and tryptophan were similar in both proteins. There was no appreciable change during storage, in the concn. of histidine, lysine, methionine, cystine, tryptophan, phenylalanine and proline in egg protein, but there was a loss of arginine and tyrosine from the albumen protein. The values obtained for tryptophan are higher than those in the literature, probably due to the use of enzymatic digestion for the hydrolysis of the protein rather than the customary alkaline procedure. The fewest mg. of each of the amino acids per egg albumen were in eggs stored 9 mos., and per yolk in the 26-mo. period, except for methionine which occurred in the least amt. in the 23-month group.—*S. L. Bandemer.* (Biological Abstracts)

GORESLINE, HARRY E., ROY E. MOSER, JR., and KIRBY M. HAYES. *(U.S.D.A., Washington, D. C.)* A PILOT SCALE STUDY OF SHELL EGG THERMOSTABILIZATION. *Decennial Conference Program, Institute of Food Technologists, May 1950, Chicago,* page 45. —The stabilized eggs were treated in a special machine for 16 minutes under a flowing film of oil at temperatures ranging from 130°F. to 139°F. It was found that heating above 136°F. produced an opalescence or milkiness in the white. The whip of the egg white was somewhat impaired by the heat treatment. The albumen index remained high and rather uniform during the storage period and the white did not show thinning to the same extent as the untreated eggs. The yolk index showed very little influence of the treatment. As shown by candle grading and broken out appearance, the stabilized eggs retained their interior quality better throughout the eight-month storage period than did the oiled and untreated eggs. (Experiment Station Record)

HARTSELL, S. E. *(Indiana Exp. Sta.)* THE GROWTH INITIATION OF BACTERIA IN DEFROSTED EGGS. *Decennial Conference Program, Institute of Food Technologists, May 1950, Chicago,* page 53. (Experiment Station Record)

HENDERSON, EARL W. BREED DIFFERENCES IN MEAT TYPE SCORE AND WEIGHT OF 12-WEEK-OLD COCKERELS. *Quarterly Bulletin, Michigan State College, May 1950, 32:* 507.—Significant rank with respect to meat type score was as follows: 1) Cornish, 2) Cross-bred whites, 3) "Meat type" Leghorns, 4) New Hampshires and White Rocks, 5) Rhode Island Reds and Barred Rocks.

Significant weight rank was 1) New Hampshires, 2) Rhode Island Reds, White cross breds and Barred Rocks, 3) Cornish, Leghorn and White Rocks.

Evidence that meat type of purebred S. C. White Leghorns can be improved by selection beyond that of the average of existing heavy breeds is presented. (Experiment Station Record)

HILL, E. G., GWENDOLYN R. BURTON, and L. W. CHARKEY. *(Colorado A. and M. Coll., Fort Collins.)* THE NUTRIENT CONTENT OF HIGH AND LOW QUALITY FRESH EGGS. III. MUCIN IN RELATION TO TRYPTOPHAN. *Poultry Sci. 28:* 862-866. 1949.—Egg white contained neither free tryptophan nor mircobiologically active pseudo-tryptophan. Mucin, present in greater amounts in high quality eggs, was separated from both high and low quality egg white fractions, hydrolyzed by 20% NaOH and analyzed for tryptophan. Mucin contained approx. 4 times more tryptophan (avg. 4%) than whole egg white protein derived from similar egg fractions. Tryptophan content of mucin was higher with advance of the egg-laying season, higher in mucin from thin than from thick white, and higher in mucin from low than from high quality egg white of same date.—*L. W. Charkey.* (Biological Abstracts)

KINARD, D. T. *(Georgia Exp. Sta.)* DESIGN FOR AN EGG COOLER. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 1950,* page 153. (Experiment Station Record)

KLINE, LEO, HELEN L. HANSON, R. E. FEENEY, and HANS LINEWEAVER. *(Western Reg. Res. Lab., Albany, Calif.)* EGG POWDER OF GREATLY IMPROVED STABILITY. *Decennial Conference Program, Institute of Food Technologists, May 1950, Chicago,* page 52.—Glucose participates to a greater extent than heretofore supposed in the reactions responsible for loss of either palatability or baking function during storage of whole egg powder at moderate or elevated temperatures. Glucose also reacts with cephalin, a phospholipid occurring in the fat fraction. The British investigators considered a yeast fermentation process for removal of glucose to be impractical, because of the introduction of foreign flavors. The yeast-fermentation process employed in the present work has led to the preparation of commercially spray-dried glucose-free powders in which foreign flavors were not detectable by a trained taste panel. The glucose-free powders are markedly more stable than the normal product as regards both flavor deterioration and baking-quality loss. (Experiment Station Record)

LARZELERE, H. E., and W. A. NICHOLS. WHAT CONSUMERS THINK ABOUT THE EGGS THEY BUY. *Quarterly Bulletin, Michigan State College, May 1950, 32:* 513.—On the basis of the consumers' preferences given in this report, three suggestions may be made: 1) Maintenance of a rapid turnover in the stocks of eggs held, a recommendation desriable for the grading station, the city wholesaler, retail store. 2) Greater attention in grading operations to the candling of brown-shelled eggs because of the apparent tendency for more of the off-grade qualities to appear with the so-called top quality eggs. 3) Further, specific attention can be well directed by poultry breeders to develop birds, and by poultrymen to use such strains of birds in their flocks which tend to lay a minimum of eggs having the undesirable characteristics mentioned above. (Experiment Station Record)

LAW, J. M. *(Arkansas Exp. Sta.)* EGG MARKETING AND MANAGEMENT RELATIONSHIPS IN THE SOUTHERN REGION. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 1950,* page 154. (Experiment Station Record)

LORENZ, F. W. EGG WASHING FIELD TRIALS. STUDIES INDICATE CLEAN UNWASHED EGGS ARE MOST SUITABLE FOR SATISFACTORY STORAGE. *California Agriculture, 4:* 15, April 1950.—Perhaps the most striking observation made in these trials was the uniformly excellent condition of the unwashed clean eggs stored as controls. In over 14,000 eggs examined only 0.2% were spoiled—less than one egg per case of 360. Unwashed light dirties had very little more spoilage, 0.4%, and from most ranches it was no greater than that of the clean eggs. Practically all of the trouble was found in the eggs that had been washed. An average spoilage of 3.6% was observed in all eggs washed during both trials by a variety of methods and under different sets of conditions.

The effect of water temperature was studied using a roller-type washer with towel covered rollers and sprayed water. As expected from the results of previous experiments, higher water temperatures produced less spoilage than cold water. With water striking the eggs at 70°F, 104°F, 122°F, and 140°F the spoilage of eggs coming out of storage was 2.9%, 2.3%, 0.9% and 0.8% respectively. The advantage of high water temperature may not be counted on too heavily, however, for other eggs from the same hens but washed on the ranch gave poorer results. These eggs were washed on a similar machine with water at 140°F, and 2.4% spoilage was found in the light dirties, as compared with 0.4% in light dirties alone washed at this temperature at Davis. The reason for this discrepancy is not known.

Dry cleaned eggs had less than one percent spoilage. The most noteworthy observations were the tremendous variations between different ranches in the spoilage of washed eggs. Samples of washed eggs from three ranches had no spoilage at all; four had less than 1% and 11 had from 1.6% to 11.6%. Samples from two ranches contained 37% and 38% spoilage.

The most striking thing about these differences was the lack of any observable reason for them. Water temperatures varied from 78°F. to 148°F. but the highest temperature was used by the ranch that had the worst spoilage. (Experiment Station Record)

LORENZ, F. W., and PHOEBE B. STARR. *(U. California, Davis.)* THE SOUR EGG PROBLEM: CORRECTIVE MEASURES NOW RECOMMENDED MAY BE MODIFIED AS STUDIES PROGRESS. *California Agric. 3:* 13, 16. 1949.—Souring of poultry eggs in storage is caused by species of *Pseudomonas*. Only clean, unwashed eggs should be stored. Dirty or washed eggs should be used immediately.—*G. W. Bohn.* (Biological Abstracts)

McSPADDEN, B. J. *(Tennessee Exp. Sta.)* EGG QUALITY AS INFLUENCED BY MANAGEMENT AND TREATMENT. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 9, 10, 11, 1950,* page 152. (Experiment Station Record)

MORGAN, AGNES FAY, L. E. KIDDER, MARIAN HUNNER, B. K. SHAROKH, and RUTH M. CHESBRO. *(U. California, Berkeley 4.)* THE THIAMINE, RIBOFLAVIN AND NIACIN CONTENT OF CHICKEN TISSUES AS AFFECTED BY COOKING AND FROZEN STORAGE. *Food Res. 14:* 439-448. 1949.—Thiamine, riboflavin and niacin were determined by chemical and microbiological methods in the leg and breast muscles, liver, heart, gizzard and skin of 116 young chickens, 60-84 days old. All tissues were examined both uncooked and cooked, shortly after slaughter and after 4, 8 and 12 months frozen storage. In the fresh raw samples the active muscles of leg, heart and gizzard contained 0.18 to 1.10 mg. % riboflavin, 3-10 times as much as did the inactive breast muscle and skin. The liver contained 2.8-3.2 mg. % riboflavin. Ten to 20% of riboflavin was lost in cooking but none in storage up to 8 months. The leg muscle and heart had 0.05 to 0.12 mg. % thiamine, which was 2-3 times as much as was found in the breast and skin. The gizzard was found to be unusually poor in thiamine. The liver contained 0.23-0.31 mg. % thiamine. Twenty to 40% disappeared in cooking but there was little lost in storage. Niacin was fairly evenly distributed in all tissues, 4-7 mg. %, except in breast, skin and liver, which were about equal in value, 8-12 mg. %. There was 10-20% loss in cooking but little loss in storage up to 8 months.—*A. F. Morgan.* (Biological Abstracts)

WOLK, J., E. M. McNALLY, and N. H. SPICKNALL. *(Beltsville, Md.)* THE EFFECT OF TEMPERATURE ON THE BACTERIAL INFECTION OF SHELL EGGS. *Decennial Conference Program, Institute of Food Technologists, May 1950, Chicago,* page 42.—Increase in percentage of infected eggs is directly proportionate to the temperature. At all temperatures the bacterial infection after 21 days was down to approximatly that of fresh eggs, after having reached a peak which occurred at from 7 to 18 days.

It is concluded that penetration and survival of bacteria in shell eggs is favored by elevated temperatures, the optimum of the temperatures used being around 77 F. (25°C.). (Experiment Station Record)

A STUDY OF ALTERNATIVE METHODS OF MERCHANDIZING TURKEY MEAT. *Sixty-Second Annual Report of the Director, Purdue University, Lafayette, Indiana, for the year ending June 30, 1949,* page 17.—A new consumer package which could be opened for inspection was introduced in the fall of 1948. The improved package was well received by both the trade and the consumer. Since the demand for

light meat quarters was greatest, it was necessary to sell dark meat quarters at from 10 to 25 cents a pound less than the white meat quarters. Most stores found that a spread of 13 cents equalized sales of light and dark quarters. (Experiment Station Record)

ESTROGENS IN IMPROVING QUALITY OF DRESSED POULTRY. *Dominion Experimental Farms in 1947, Annual Report of the Director*, page 56.—Some of the synthetic estrogens which have been tested are diethylstilbestrol, dimethyl ether of diethylstilbestrol, dinestrol diacetate, hexestrol, dimethyl ether of hexestrol and dimethyl ether of dienestrol. These were found to have varying degrees of effectiveness and some to be more effective when given by mouth than when injected hypodermically or implanted under the skin. The advantages of being able to mix the hormone in the feed are obvious.

Since it is necessary to be positive that the carcasses of birds which are hormone treated are harmless to those who consume the meat of the birds a large amount of research has been carried out in co-operation with the officers of the Food and Drug Division of the Department of Health and the Pathologist of the Ottawa Civic Hospital. The first mentioned officers were supplied with tissues from the birds treated in the experiments which they assayed on rats for their content of hormones. It was found that considerable residues of some hormones were left in the carcasses. When similar tissues were fed in quantities which could easily be consumed by persons eating chicken in the ordinary way it was found that definitely harmful effects were produced. A regulation forbidding the use of such compounds for feeding to market poultry in Canada was enacted under the Food and Drugs Act. If and when estrogens are found to develop which do not have such an effect and there is already evidence that such do exist, the regulation could be altered accordingly. (Experiment Station Record)

MANAGEMENT

BYWATERS, J. H., and R. B. DAVIS. *(Virginia Exp. Sta.)* INFRA-RED LIGHTS AS SOURCE OF DIRECT HEAT FOR BROODING CHICKS. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 1950*, page 150. (Experiment Station Record)

GODFREY, G. F., and W. F. RHODES. *(Oklahoma Exp. Sta.)* THE EFFECT OF WASHING EGGS ON THEIR HATCHABILITY. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 1950*, page 152.—Dipping eggs in a hot detergent solution followed by a hot and cold water spray seemed to be the most practical method of cleaning dirty hatching eggs. Economically, however, it is cheaper to follow appropriate management practices and produce clean eggs. (Experiment Station Record)

KING, D. F. *(Alabama Exp. Sta.)* PRODUCING MARKET EGGS IN SINGLE-DECK LAYING CAGES. *Proceedings Association of Southern Agricultural Workers, 47th Annual Convention held in Biloxi, Miss., February 1950*, page 150. (Experiment Station Record)

FEEDING LAYING HENS BY HAND OR FEED HOPPER. *Dominion Experimental Station, Morden, Man. Progress Report 1938-1946*, page 82.—The results show both feeding methods were equally efficient for egg production. Hopper feeding appears to be favored for labor saving and it also ensures correct feeding where the poultryman is either inexperienced or cannot afford the time for regular hand feeding. (Experiment Station Record)

GENERAL

TSCHERNIAK, ALEXANDER. STICKSTOFFVERLUSTE BEIM TROCKNEN VON GEFLUGELEXKREMENTEN. [NITROGEN LOSSES IN THE DRYING OF POULTRY DROPPINGS.] *Landw. Jahrb. Schweiz 62:* 547-554. 1948. (Biological Abstracts)

Note:

The Experiment Station Record, published by the Office of Experiment Stations, United States Department of Agriculture, was discontinued as a publication several years ago. References to "Experiment Station Record" in some of the items of this abstract material, therefore, refer not to the publication of this name but to the records kept by the Office of Experiment Stations.

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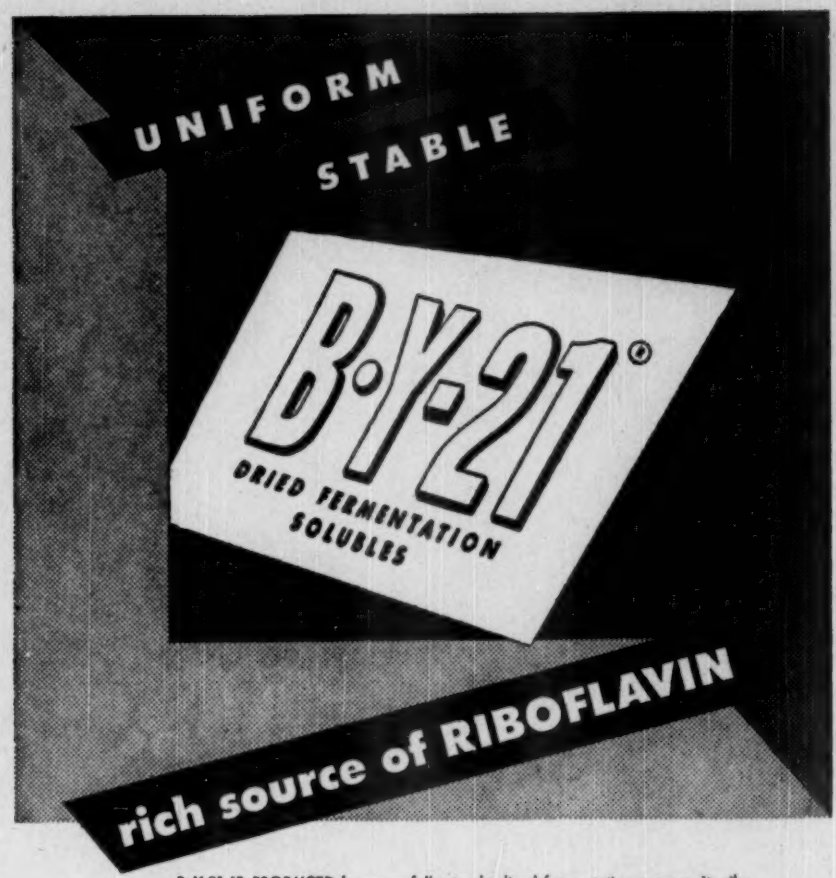
Safeguard your investment in high capacity layers. Increase egg production per pound of feed and save feed costs! Include STONEMO in your feeding program. Get it from your feed or poultry supply dealer.

STONE MOUNTAIN GRIT COMPANY
Lithonia, Ga. • Barre, Vt.

STONEMO The Grit with the EXTRA GRINDING SURFACES



B-Y-21 IS PRODUCED by a carefully-standardized fermentation process. Its riboflavin potency is guaranteed at 8000 micrograms per gram, or 3630 milligrams per pound. B-Y-21 is economical and easy to use in mixed feeds. It gives you thorough, uniform dispersion, and stability in storage. B-Y-21 is all feed but its price is based only on its riboflavin content. Investigate B-Y-21. Available in convenient 50-pound bags.

ATTENTION FEED MANUFACTURERS! If you haven't already received the B-Y-21 Guide & Calculator, write for it today. It shows you how to determine riboflavin additions needed in your feed formula quickly and easily.

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Anhydrous Ammonia · Benzene Hexachloride · Choline Chloride · Condensed Distillers' Molasses Solubles · Dilan · Ethyl Formate
Metaldehyde · Niacin · Butyl Fermentation Solubles and Riboflavin Feed Ingredients

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